EATING
FOR
HEALTH
AND
STRENGTH

PORTRAIT OF THE AUTHOR

EATING
for Health *and* Strength

BY

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cause of their pitiful ignorance on the subject of diet.

You can starve to death while you are eating three "square" meals a day, and that is exactly the status of literally millions of people at this time.

This book has been written with the aid of various experts for the purpose of telling the truth about food. It shows you, in a very definite manner, what to eat and how to eat, in order to maintain your vitality at high water mark.

The facts presented here should be taught in the primary schools, and the day is coming when such knowledge will be possessed by every growing child.

And I believe that this book will help to bring that day about.

To insure the keeping quality of the foods prepared for the market, manufacturers often remove the life-building elements.

Devitalized foods of this character are being sold everywhere. You should possess the knowledge necessary to avoid products of this nature. The facts presented in this book will be of inestimable value to you for this purpose alone.

Learn how to eat that you may build your body into a masterpiece—mentally, physically and spiritually.

Make a whole man or woman of yourself.

Proper eating will do much to bring about this result. In fact, without an intelligent diet, the most strenuous efforts towards the attainment of life's great rewards are often wasted.

Learn the truth. Apply it and satisfying rewards will surely come to you.

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EATING FOR HEALTH AND STRENGTH

CHAPTER I

Food Science and Personal Efficiency

FOUR small boys once came to a green apple tree.

The first boy was innocent and ignorant, and ate of the apples.

The second boy had been warned by his mother, but the example of the first boy and the taste of the apples overcame the force of that warning, and he also ate of the apples.

The third boy had eaten of green apples before, and remembered the pains therefrom; but the taste of the apples, being an immediate pleasure, overcame the thought of future pain, and he also ate of the apples.

The fourth boy was different. Perhaps he had been warned, perhaps he had observed, perhaps he had had experience; but he resisted the temptation, and so avoided future pain.

So people differ in this world as to their ability to resist temptation to indulgence or the erroneous example of others.

The woman who reclines among her pillows reading novels and eating chocolate creams is but another example of the small boy at the green apple tree. While she reads of the "lithesome form" and "bubbling vitality" of the heroine, and sighs in covetous ecstacy for a share of the romance, she is deliberately killing her own chance for either joy or romance, because her indulgence, whether born of ignorance or a weak will, is storing up an obesity that will destroy her beauty and shorten her life.

All of us humans want happiness, but we differ as to our ideas of the way to get it. The sensualist attempts to get his happiness from the immediate stimulation of the appetites without forethought as to the ultimate outcome. He stuffs his stomach with the most stimulating and delectable viands, regardless of the agony of future dyspepsia, the pains of gout, the humiliation of obesity or the tragedy of a death before his time.

The temperate man takes forethought of the total happiness to be had from life and, by the study of the laws of human health and efficiency, and the denial of the more immediate and in-

dulgent pleasures, he safeguards his happiness for the future by obedience to life's laws.

It is for those who have the forethought, who wish to gain the most out of life as a whole, that this book is written.

Granted that you believe the health of the body, the efficiency of the mind and length of life to be worth striving for, no argument should be needed to convince you of the importance of the subjects of food and the nutrition of the body.

The business of eating is not a rare or remote experience in life, but it is ever with us, usually about three times a day. The question of eating concerns all, but it concerns us differently.

It concerns the poor man chiefly from the economic viewpoint. Wild animals and "savage" men spend most of their time in food getting. So even in the state of civilization the average man spends nearly half his income—that is, his working time, of which his income is the measure —in the getting of food, and a goodly share of his leisure in the eating of it. The prosperous man, for whom the getting of food becomes relatively less of a problem, just because of the fact of his greater wealth and leisure, is apt to concern himself more with the question of the taste and appearance of his food.

But neither rich man nor poor man, if he be a forethinking man, who would gain the greatest strength and health of body and mind and the maximum length of life upon this earth, can avoid the question of the effect of food upon the health, vitality and longevity.

In this book, I shall not wholly ignore matters of the economy or of the taste and palatability of food; but the primary purpose of the work, and the subject to which most attention will be given, is the answering of questions concerning the relation of food to health and strength and the general efficiency of our lives.

For this purpose the subject cannot be intelligently presented without some scientific discussion. The necessary scientific knowledge I shall strive to present as briefly as possible and with a view to its practical application.

The scientific knowledge of food has made rapid strides in recent years, partly on account of the tremendous importance of food problems during the war. Much new knowledge has also been acquired recently from biological investigations or experimenting upon animals. It is possible that some readers may question the worth of food facts derived from experimenting upon pigeons or rats. We are not at liberty to experiment so freely upon human beings; and as

the laws are fundamentally the same for all or at least all kindred species, the student of human food science should welcome this knowledge derived from animal experimentation, but seek to check it by practical observation upon human beings.

I give the results of the biologists who experiment on animals, because they throw interesting light on human food problems, but the practical teachings of this book are by no means wholly derived either from investigation of chemists or animal experimenters. The final and true source of all knowledge of human nutrition and, for that matter, all knowledge of human life and health, must be derived from human observation and experience. It is from this human source that I have derived my own fundamental views and practical knowledge of dietetics and health.

The second, third and fourth chapters of the book will survey briefly the chemistry, the physiology and the biology of food. In these chapters you will find the necessary scientific groundwork to enable you to understand better the later discussions. The fifth chapter considers "What to Eat," and treats of the nutritional values of various foods. Following this we consider the balancing of the diet, or the effect of combining and proportioning foods, and "How and When

to Eat." We then discuss "How Much to Eat," or the question of food quantity.

The four chapters next in order will cover the subjects of the production, marketing and manufacture of food, the preparation of food in the home, or practical cookery, and the question of food economy or the "Cost of Living."

Those chapters thus far enumerated will serve to give you a general knowledge of food science and the practical application to the economical and efficient nourishment of the body; all these chapters will be of equal interest and importance to all readers. The remaining eight chapters of the book are devoted to eight special health or personal living problems in which the reader's interest may vary somewhat, according to his own physical condition or personal needs. Thus, some of you want to know how to eat to gain weight, and others how to eat to reduce weight. The problem of eating for maximum physical strength and efficiency should interest all, and the similar problem of the effect of food and our eating habits upon mental efficiency is of equal importance in the world in which most men labor with their minds. Questions of the effect of food upon the sexual and procreative life, and problems of feeding children for health and growth are vital ones for individual happiness

and social welfare. The problem of the effect of food upon the length of life concerns or should concern us all, but will naturally be of more concern to those advanced in years; hence is treated from that viewpoint. The relation of food to the prevention and cure of disease is but another aspect of the general problem—for health is but the absence of disease, and disease the absence of health.

CHAPTER II

Food Chemistry

THE human body and the foods eaten by man are of necessity composed of the same chemical elements, since the one is made from the other. This is strictly true if we class water as a food. Oxygen from the air also enters into living tissue but oxygen is also derived from food and water. The elements composing water, oxygen and hydrogen, are the two most abundant elements composing the living flesh. The next most important is carbon, which we know in coal and also in diamonds, though neither substance is used for food—which is fortunate as they are both expensive. The fourth important element is nitrogen. We do not get it from the air, though it is there in abundance, in the elementary form. Nitrogen, combined with the three preceding elements and very small proportions of certain minerals, forms complex substances known as proteins. Protein in various forms and combined with from two to three times its weight of water, composes all living tissues except fat, and the mineral structure of the bones.

Fat, which is merely stored fuel, is composed of carbon, hydrogen and oxygen. The bones and teeth are chiefly made up of calcium phosphate, a combination of calcium, phosphorus and oxygen. About ten other chemical elements also enter into the composition of the human body and must, therefore, be derived from food. All of these are minerals, and all are present only in small quantities. Because of the small amount of these minerals needed in the life processes their importance was for a time overlooked. More recent knowledge has shown this to be a grave error. For illustration, iron existing in the human body in proportions of only one part in 25,000, is none the less absolutely essential to life, since the hemoglobin, the oxygen carrying substance of the red blood corpuscles, must contain iron. The list of minerals includes calcium, phosphorus, sodium, potassium, chlorine, iron, sulphur, magnesium, iodine and fluorine.

We can not learn much of practical worth from the mere statement of the chemical elements present in the body. The reason for this is that few of these elements are of use to the body if taken in their elementary form. We can use in breathing the elementary oxygen of the air, but the body can make no use of nitrogen, even more abundant in the atmosphere. Carbon, iron and

sulphur (and so on through the list), are examples of chemical elements that are of no use to the body in their simple uncombined form. Most of these food minerals cannot be utilized, even in their compounds, unless these mineral compounds or salts have previously been incorporated with the more abundant organic elements. This combination of minerals with carbon, oxygen, hydrogen and nitrogen, which takes place in plant life, makes it possible for animal life, including man, to exist. Without the existence of plants all higher animal forms would perish. We, therefore, live on second hand food, which has gone through one life cycle. The carnivorous animals go a step further and secure their food elements third hand, through the previous life processes of plants and other animals.

Man can exist either by this second hand or this third hand process, or a combination of the two. Human food, composed of the substance or products of plant or animal life, is generally classified by the chemist as "organic," as distinguished from inorganic or mineral substance found in the earth. Man can utilize a few inorganic substances, of which air and water are the chief. He can also make limited uses of a few minerals in their inorganic form, such as

common salt. But for the most part man depends upon organic food and can not utilize elementary or mineral substances.

As the various substances formed by the combination of chemical elements are exceedingly numerous, early food chemists attempted to classify them into a few groups and so simplify matters. The group names so chosen were "protein," "carbohydrates," "fat" and "ash," or "mineral salts."

Protein, as already explained, is the name not for a single substance, but for a large group of chemical substances, the essential similarity of which is that they all contain the chemical element nitrogen. In the early work of food analysis no effort was made to determine the exact nature of these proteins. In fact, the analysis was usually made merely by determining the amount of nitrogen present and calculating from this the amount of protein, on the assumption that proteins usually contain about sixteen per cent of nitrogen.

Two errors were made by the early food chemist in regard to protein. One was that of attaching undue importance to it as a food substance, and the other was in assuming that one protein was as good as another. Other than the water content, the body is composed chiefly of protein;

hence it seemed that protein should be the most valuable food, and that its use in larger quantities would lead to better nourishment. This proved to be an error because it was not fully realized that the chief function of food in the body was that of a fuel to produce heat and energy. For a rough illustration, we might liken the body to a boiler and engine that served the double purpose of heating the building and supplying power. The boiler and engine are made of iron. The fuel required is carbon (coal). Attempting to fire the boiler with iron would be absurd. Now the human boiler-engine can, in fact must be supplied with a limited quantity of the material of its construction, as it has the power of constructing itself in the growth or the "repair" of its mechanism. But its chief requirement is fuel for the generation of heat and energy.

The second error made regarding this group of substances collectively known as proteins, has led to many serious misconceptions regarding food values. As large quantities of protein were thought to be important, lean meat was formerly very highly rated as a food. The vegetarians, chiefly because of sentimental reasons, disapproved of the use of meat. But they fell into the grave error of assuming the need of so-called

"meat substitutes," or vegetable foods particularly rich in protein. We now know that this was a double-barrelled mistake; in the first place we need no meat substitutes because the meat diet contains entirely too much protein to begin with. Secondly, vegetable proteins, particularly those of the legumes: beans, peas, peanuts, etc., are decidedly inferior forms of protein and are only partly utilized by the living organism. This important subject will be considered further in the fourth chapter.

The second group of food substances, chemically considered, is carbohydrates. The chief carbohydrates are starches and sugars. There are several forms of sugar differing only slightly in their chemical composition. Carbohydrates form the bulk (sixty to eighty per cent) of all human diets of vegetable origin. There are no carbohydrates in animal foods except the sugar in milk. Carbohydrates are also the cheapest food substance. Grains are composed of from four-fifths to nine-tenths starch. Corn is the cheapest known food in the central and eastern United States. Wheat in the eastern United States costs nearly twice as much as corn and is still a very cheap food. Wheat at a dollar a bushel, if a man lived on it and ate it straight from the bushel, would make the cost of living

less than three cents a day. In some parts of the world, where corn is not grown, wheat is the cheapest food substance. They feed it to the pigs and chickens in Oregon. In China rice, and in India millet are the cheapest foods. In Russia it is rye and in Germany it is potatoes. The potato, chemically, is practically the same as the grains—the difference being that it is in moist form, carrying about three-fourths water by weight, and being very similar in composition to a cooked cereal porridge, as boiled wheat or corn meal mush.

Without the development of the grains and cheap roots and tubers as the dominant elements of the human diet, the present population of the world could never have existed. These foods must therefore form a great bulk of the total human bill of fare. And this involves constant danger of improper nutrition because carbohydrates, though a good fuel substance for the human engine, do not supply the elements of the body's growth nor for its proper function. Starch and sugar are related forms and contain the same elements. In fact, sugar can be made from starch as is done in the case of glucose, which is a sugar made from corn-starch.

The third general group of food substances is fat. Some fat is essential in the human diet, as

the Germans discovered during the war. A certain amount of fat makes the diet more palatable, and most of our modern cookery is based upon the use of fat to "enrich" other food substances. Yet fats and carbohydrates contain the same three elements: carbon, hydrogen, and oxygen. Their sole function in the body is that of being oxidized, or burned in our slow physiological fires, to produce heat and energy. The use of fat from foods to make the human body fat is not a case of physiological use but merely a storing of fuel food for later use. The difference between fat and carbohydrates is in the amount of oxygen present, or the degree to which the hydrogen and carbon have already been oxidized. Because the fat contains less oxygen it is capable of further oxidization, and hence a given amount of fat will create more heat and energy—two and a fourth times as much—as will starch or sugar. For this reason fat is worth more per pound. Oil, at a price of twenty-two cents a pound, is just as cheap as sugar at ten cents.

In a carnivorous diet, the carbohydrates being absent, fat becomes the chief source of body fuel. Protein can also be burned, but it burns wastefully, leaving an unoxidized residue that must be excreted from the body, chiefly through the

kidneys, a process which man is not as able to handle as well as the carnivorous animals.

The remaining group of food substances have variously been known as ash, minerals, or mineral salts. Most of these salts, in order to be available for human nutrition, must be chemically combined with the organic food elements. Thus, sulphur enters into the chemical composition of some proteins, such as egg albumin; phosphorus, on the other hand, is present in some of the fat-like substances of egg yolk. Calcium salts are a fundamental and very vital element in milk. The growth of the young animals, and consequent rapid bone formation, requires a large proportion of such bone-forming minerals. The fact that the calf grows faster than a child results from cow's milk being richer in protein and mineral salts than is necessary as a human food, even for the young. Hence, cow's milk may be diluted, or may form only a portion of the food of the child.

Mineral salts are present in varying quantities in foods of vegetable origin, but the proportion is greater in the leaves or other growing tissues than in those substances like seeds, tubers or pulpy roots which serve the purpose of food storage reservoirs in the plant's life and hence contain large quantities of starch or fat. Green

leaves are especially rich in iron; spinach being richest of any known food in iron of a form that may be utilized by the human body.

The usual tables of the chemical analysis of food give the percentage of protein, carbohydrates, fat, mineral salts and water. The proportion of the water is, of course, a very important consideration when estimating the value of food by the pound. For illustration, fresh fruit such as peaches contains about eighty-five per cent of water and only fifteen per cent of actual food substance. But dried peaches contain about fifteen per cent of water and eighty-five per cent of food substance. Hence, the latter, ignoring the question of the superior flavor of the fresh fruit, would be worth nearly six times as much per pound. Another illustration to show the importance of considering the water in food, is that of dry versus cooked cereals. A menu giving an item of "four ounces of cereal" if interpreted as the dry cereal, would have at least four times the food elements than if the dish be considered as meaning four ounces of the ordinary cooked cereal porridge.

Tables of food analysis also usually have a column headed "calories per pound." The calory is a unit of measurement taken from the physicist and is primarily a unit of heat. If a given quan-

tity of food contains so many calories, it means that if burned it would give off so much heat. Most of our food is burned in the body; that is, oxidized, with the result that heat is always produced. A certain portion of this heat energy may be transformed into mechanical or muscular energy. But mechanical energy can not be created in the living body, nor in the engine cited so often to illustrate bodily functions, without the producing of considerable heat. That is why we get warm when we exercise.

The use of the term "units of heat" is sometimes misleading. Heat and temperature are related but different things. The thermometer measures units of temperature.

A pint of water at a temperature of 100 degrees is twenty temperature degrees hotter than a pint or a quart of water at a temperature of eighty degrees. The number of degrees of temperature are not affected by the amount of water. Heat units do consider the amount of water and a quart of water at a given temperature contains twice as many heat units as a pint of water at the same temperature. It also takes twice as many heat units to raise the quart of water a given number of temperature degrees, and it would take twice as much fuel to heat it.

The human body is always maintained at a

temperature very close to 98 degrees. Any departure from this temperature is a serious business—fever temperature rarely rises above 105 degrees.

The heat of the body is supplied by the oxidation or slow burning of the fuel foods. The amount of heat required to maintain the body at its normal temperature of ninety-eight degrees will depend on the temperature of the surrounding air, the amount of clothing, and the size of the body which affects the amount of radiating surface from which heat may be lost.

The evaporation of water absorbs heat very rapidly. And considerable water is constantly being evaporated from the moist surface of the lungs and from the moist skin. The over heating of the body is prevented by the control of the amount of this evaporation. On a hot day, or when generating extra heat by muscular exertion, a man sweats, while a dog or a chicken "pants" to secure this extra evaporation. The degree of relief from this extra evaporation will depend on the humidity of the atmosphere.

The body is kept from getting too cold by the actual stimulation of extra oxidation, but this oxidation to generate extra heat seldom occurs with a man wearing the usual clothing and exposed to the usual temperatures. The muscular

action of heart, lungs, etc., ordinarily generates ample heat indoors or in hot weather, while out of doors in cold weather we instinctively keep the voluntary muscles active. Man, therefore, seldom needs extra food just to generate heat, as the heat produced during the muscular action is nearly always sufficient, and usually more than sufficient so that the excess must be taken care of by evaporation.

The calory measures the value of the food from the standpoint of its power to produce heat and energy. It takes "calories" to keep us warm and to make our muscles work. Moreover, we measure the fat-forming tendencies of food by calories, because fat in the body is derived from elements which, if oxidized or used as body fuel, would create heat and energy. Bodily fat may be derived either from fat or from carbohydrates or, somewhat wastefully, from protein.

Because the bulk of our food is utilized in creating heat and energy, or if taken in excess is stored as fat, we commonly consider the number of calories in the diet as the unit of measure of the *amount* of the food eaten. It is a somewhat dangerous method of food measurement, because it measures only one essential function of food. Thus out of the daily ration of two pounds of food, eighty to ninety per cent may be

utilized in the body for oxidation, and hence be measured correctly by the number of calories, yet the remaining ten to twenty per cent, including the protein, is fully as essential to health and life as the more bulky fuel portion, the measure of which is expressed in calories.

Since fat and carbohydrates are utilized in the body in almost exactly the same way, and the essential value of both may be measured in calories, it was formerly thought that the statement of the number of calories and of the amount of protein was sufficient to give a true conception of the worth of a given food or of a given diet. By these two terms we may measure ninety-eight or ninety-nine per cent of all the weight of the food substance. But the remaining one or two per cent, including the mineral salts and the vitamines, while insignificant in quantity, are still just as vital to life and health as the more than bulky portions. We can even go further and state that a single mineral or a single vitamine, which in quantity may be less than one thousand of the weight of the food, is absolutely essential to life, and if "deficient" in a diet, its lack will cause quite as serious results as if the whole quantity of food was insufficient.

The term "calories" is of value in considering food from the quantity standpoint. We can

form approximate ideas of the worth of food per pound in the number of calories it contains. We can also intelligently discuss the total amount of food that should be eaten in terms of calories. But such considering of food quantity is only safe when the diet has first been properly selected and proportioned to make sure of the inclusion of sufficient variety and proper amount of the essential minor food elements. Unless these other factors are first considered the study of food in terms of "calories" is apt to prove a delusion and a snare. Thus "calories" alone will proclaim that one and a half pounds of starch or five-eighths of a pound of oil is a sufficient daily food allowance for a man. Obviously, neither substance, nor any combination of the two substances, would support life; though they would supply heat and energy, they would not prevent starvation because of lack of other food elements. In fact, it has been demonstrated that an animal will starve to death more quickly on such mere "fuel foods" than if undergoing a complete fast. The reason for this is that the process of digestion and the subsequent oxidation of the fuel food consumes the body store of these rarer food essentials and hence results in their exhaustion more quickly than when undergoing a complete fast.

This old-time chemical analysis of food as protein, carbohydrates, fat, mineral salts, and in calories per pound, is still valuable information for those who are also informed of other and more recent aspects of food science. But this mere chemical analysis taken alone is not of much practical use and has doubtless often been worse than useless. A little knowledge is a dangerous thing, and what the analytical chemist can tell of foods by consulting his test tubes and without studying effects on the living body, is only a little of the knowledge of foods that is available for us today.

CHAPTER III

The Physiology of Nutrition

BROADLY considered, all physiological or life processes relate to nutrition, and are affected, directly or remotely, by food. Digestion is most immediately and wholly related to food, since digestion is the process of converting food into those substances which then become the living tissue, or which supply the living tissue with materials for its activities. A second group of physiological functions or activities most directly connected with food or nutrition, includes the transformation of food elements in the liver, the distribution of these elements of food in the muscles, and the elimination of waste products of the body through the lungs and through the kidneys.

The process of digestion is primarily a chemical one, but there are also mental or nervous factors and physical factors to be considered. The chemical process of digestion begins in the mouth and continues throughout the length of the alimentary tract.

The transformation which the food undergoes

in the different digestive organs varies with the nature of the food. Thus the digestion of starch begins in the mouth and is checked in the stomach, but is completed in the small intestine. On the other hand, the digestion of protein occurs chiefly in the stomach. Fat is digested almost wholly in the intestines.

The chemical process of digestion is carried on by means of enzymes or ferments, secreted by the digestive glands. With these ferments, which are highly complex chemical substances, the digestive glands secrete simpler substances, the purpose of which is to give an alkaline or an acid reaction to the material being digested.

The saliva or digestive juice of the mouth is weakly alkaline and contains a ferment known as ptyalin, which has the power of converting starch into sugar. This may be demonstrated by the fact that dry bread, when thoroughly masticated, develops a sweet taste.

When the food passes into the stomach it meets the gastric secretions, the strong hydrochloric acid of which counteracts the alkaline effect of the saliva and gives the contents of the stomach an acid reaction. This acid, it seems, is necessary to enable the ferment pepsin to get in its work—dissolving the protein elements of our food. Digestion, in the stomach, is not completed, how-

ever, even for protein. The main function of the stomach seems to be to act as a warehouse to take care of our irregularly eaten food and to dole it out in a slow and carefully regulated stream to the more important digestive organ, the small intestine. During this period of temporary storage, a certain churning about and thorough intermixing of the food occurs. The chemical transformations, however, are of a preliminary nature. We are inclined to give the stomach more credit and attention because of its prominence and because when overloaded it makes its presence known.

Shortly after the food passes into the small intestines, it encounters the very powerful digestive ferments secreted by the pancreas and also the bile from the liver. Other ferments are secreted from the walls of the intestines, the total effect of these secretions in the intestine being to give a strong alkaline reaction and to recontinue the digestion of both starch and protein as well as to commence and complete the digestion of fat.

This process of digestion continues throughout the length of the small intestine which is also the chief organ of absorption of the digested food elements into the blood stream.

Digestion is nearly completed by the time the

stream of material reaches the colon or large intestine. The function of this latter organ is chiefly that of retaining the unabsorbed material or food waste.

The changes which occur in the digestion of the various groups of food material are essentially as follows: Water, whether taken separately, or the water contained in moist food is absorbed without chemical change. This absorption of water may take place in any portion of the alimentary tract. Water drunk between meals is absorbed directly from the stomach. The rate of absorption of water will depend upon the degree of moisture of the food, or the amount of water drunk with it. If the food is eaten dry, water will be secreted from the blood to bring to the food a suitable liquid condition. It was formerly given as a generally hygienic advice not to drink with meals. More recent investigation has shown that moderate drinking with meals aids digestion, provided the drinking of water or other liquid is not for the purpose of washing down foods and thus preventing sufficient mastication and salivation.

Next to water, the sugars are absorbed with the least digestive change. True fruit sugars undergo no chemical change for they exist in fruits in the same form as the sugar in the blood.

Cane sugar (that derived from beets is chemically the same) is a more complex substance, which must be broken up into the simpler sugars such as exist in fruits or in the blood.

Starch is a still more complex substance, composed of the same primary chemical elements as the sugars. Starch is not soluble. In digestion it undergoes a complex process of being "hydrolized," which merely means that more hydrogen and oxygen, in the form of water enters into chemical combination with the starch and so changes it into sugar. There are several steps of this change, the intermediate products being gum-like substances called dextrins. This process of the simplification of the starch molecule can be partly brought about by heat. This occurs in the toasting of bread, or more completely in the manufacture of zwieback. Certain manufactured cereals are similarly treated and are known as pre-digested foods. There is no evidence, however, that this partial performance of the natural digestive function outside the body is any advantage to a healthy man.

We were formerly taught that the human being could not digest raw starch; a view which seems rather absurd as it assumes that man is by nature a cooking animal. The moist cooking of starch does not change it chemically but only

results in the dry starch grains swelling up to a pasty-like mass. The result is that digestion may occur somewhat more rapidly, but undesirable fermentation may also occur more readily. Man has power to digest starch either raw or cooked, and difficulties which occur in its digestion are probably due to the use of too great a proportion of starch in the diet.

Another artificial process of "digesting" starch is by means of treating it with strong acids, as in the manufacture of glucose from corn-starch. Chemically pure glucose is a wholesome product, for it is indeed the same sugar that occurs in fruits and in the blood. The commercial product may contain common salt derived by the combination of hydrochloric acid and sodium hydroxide which are used in the process of converting the starch into dextrose. The prejudice against glucose as food is founded upon ignorance of its nature; it is a better food than raw starch of which it is made, or cane sugar which it replaces in the diet. The practical trouble is that the present-day civilized diet already contains too much food of this sort which crowds out other essential food elements. Hence, though starch, sugar, glucose, etc., are all good foods, their use should be discouraged as the tendency is to overuse them.

Though we do not list soap as an article of food—and only feed it to small boys who have been telling lies—yet a substance very akin to soap is found in food as an intermediate stage in the digestion of fat. Fat is insoluble, and hence cannot pass through the walls of the intestine, but fat treated with alkali becomes soap or is saponified, and in this soluble form passes through the intestinal wall; then the alkali is removed again and the fat restored, existing in the blood in the form of tiny fat globules.

The digestion of protein is a very complex process. Like fat, protein is not soluble, and hence it is broken down into its simpler ingredients known as amino-acids. There are a large number of these and they are not alike; the different combinations and proportions of these amino-acids account for the different kinds of proteins. This explains why all proteins are not of equal value for the nourishment of the body. These various amino-acids are recombined, after absorption, into the various proteins needed by the body. These may be like the proteins of the food, but are more apt to be entirely different proteins which have been made out of the food proteins but with the discarding of considerable portions of their substance. The amount of protein actually needed to nourish the adult is

small, and that amount depends upon the nature of the protein in the food. Some proteins taken alone will not support life at all. Gelatine is one of these, and for this reason it was formerly thought to be without food value. It is now known that gelatine has food value when combined with other proteins which supplement the particular amino-acids which the gelatine lacks.

Chemically considered, the processes of digestion seem to be exactly like similar processes which may be conducted by the scientist in his test-tubes. But into the chemistry of life processes a factor enters which does not exist in the laboratory processes. This factor is a nervous or mental one. We have long known that the sight, smell or taste of food causes the "mouth to water," but it is only more recently that scientists have discovered that the secretions of digestive juices are influenced in quality as well as quantity by such nervous or mental stimulation.

Still more remarkable, as it at first seems, not only is the secretion of saliva affected in this manner, but the secretion of the gastric juice is also affected by the offering of food to the senses, and before such food enters the stomach. Thus, if meat be held up before a hungry dog, the dog's stomach immediately begins the secretion of

gastric juice—and a more acid juice is secreted than if the dog be offered bread. From such experiments we can reason that the entire process of digestion is very skillfully adapted to the nature and quantity of the food. Obviously, the appeal of food to the senses has only a preliminary effect, and such adaptation by means of nerve stimuli to the secreting glands must go on throughout the entire process of digestion, as it does indeed throughout all physiological processes.

The practical application of such knowledge would seem to argue in favor of the simplification of the diet and of the use of foods in their more elementary or natural form. How these physiological instincts can adapt themselves to the highly artificial and complicated civilized diet is a mystery! Indeed, they probably do not adapt themselves completely, which is doubtless one of the reasons why the highly complicated and over-seasoned bill of fare is not as digestible and wholesome as a simpler diet derived from natural foods.

We are frequently told that appetizing foods and the enojyment of our meals are conducive to good digestion and proper assimilation. This is unquestionably true, in so far as unpalatable food cloys the appetite and fails to bring forth the

proper secretion of digestive ferments. It is also true that anger, intense sorrow, or other distressing emotions will check or even entirely stop the process of digestion. But this argument in favor of appetizing foods may lead to trouble, if it is used to encourage us in the use of too highly flavored or over-seasoned foods. Such foods over-stimulate the jaded appetite, and result in over-eating. Obviously, such artificial flavors, which disguise the true nature of the food, can serve no good purpose in the adaptation of the digestive secretions to the nature of the food. But the worst feature of the use of over-seasoned food is that the man fed upon a highly stimulating diet loses the power to enjoy, and hence the power to digest simpler food. There is a very easy cure, however, for this condition, and that is genuine hunger. The over-fed gormand, who has lost all power to enjoy his meals, and who would sniff contemptuously at bread and butter, can very readily develop an appetite for old boots when a wise Providence casts him adrift at sea in an unprovisioned boat.

The third factor in the process of digestion is a mechanical one. Our teeth are given us for the purpose of chewing food, but entirely too much of our civilized dishes have already been chewed by the grinding burrs of mills, or by the chemical

processing of food factories. The result is that these ground-up, mixed-up and pre-digested foods not only discourage the use of our teeth and the accompanying process of insalivation, but a mass of food enters the stomach which is too finely ground and too readily soluble. In the natural process of digestion, the digestive solvents gradually chip off or dissolve the external portions of the food particles. But when food, instead of consisting of granules or solid particles of the natural food substance, is in a mushy, semi-soluble condition, the entire mass is attacked too rapidly by the digestive ferment, but the chemical process is not completed quickly enough. The result is that unwholesome fermentations, due to the presence of bacteria, occur. Such bacterial fermentation or decomposition may produce various toxins or poisons.

Similar undesirable fermentations with resulting developments of poisoning or auto-intoxication may occur, merely because the mass of digesting food moves too slowly through the intestines, or because the residue is retained too long in the colon.

The remedy for both evils is to be found in the use of coarser and more natural foods. The outer coatings of grain, most notably wheat bran, and the fibrous portions of vegetables, particu-

larly of leafy vegetables, contain a woody fibre known as cellulose. This cellulose fibre is not digestible and does not ferment, but passes through the alimentary tract unchanged. The presence of such fibre increases the bulk of the food waste, especially in the latter stages of the digestive process. Man was fitted by nature for a diet containing a considerable portion of such fibre, and when deprived of it, and particularly when all food has been finely ground or predissolved, the result is that digestion occurs too quickly in the upper portion of the digestive canal, and the small undigested residue remaining fails to move along with sufficient rapidity. This is the explanation of the common civilized complaint of constipation, and the associated evil results of bacterial fermentation and auto-intoxication.

The functions of digestion thus far considered in this chapter are generally understood because the subject is presented in the ordinary school physiology. But the processes of nutrition that occur after the food elements have been absorbed into the blood are not so commonly understood.

The function of the liver, we are told, is to convert the sugar, which results from the digestion of all carbohydrate foods, into a substance called glycogen. This material may be stored

by the liver in moderate quantities, and in this capacity the liver acts as a sort of temporary warehouse to store the fuel food as digested until it is required for the production of heat or energy of the muscles. Fat, which serves the same ultimate use, is not stored in the liver, but, if taken in excess of the body's immediate power to consume it, must be stored as fat throughout the various fatty deposits of the body. Either sugar or fat may be oxidized to produce heat and energy. Moreover, when carbohydrate foods are eaten in excess of the body's needs, or the liver's capacity for temporary storage, the resulting blood sugar may also be converted into fat and stored in the fatty tissues, in the same way as fat derived directly from the food.

Sugar in the blood, and hence ultimately fat, can also be derived from protein foods when these are eaten greatly in excess of our needs. This is true because the protein molecule contains carbon, hydrogen and oxygen, the elements of both sugar and fat. But the protein also contains nitrogen, and sometimes other elements which cannot be oxidized or burned. When protein is eaten in excess of the body's needs, a portion of it is thus wastefully used, the same as carbohydrates or fats, but the nitrogen is useless and must be excreted as a waste product. This

excretion occurs through the kidneys in the form of urea. This disposition of excess protein must not be confused with the more normal use of protein, which is to build up the protoplasm of active cells and tissues. In the case of growth, such protein actually becomes a part of the living tissue. The individual cells are constantly breaking down and being replaced by others, so that there is a certain process of cell growth always going on, even in the adult. The protein that has gone through this cycle and become part of the living tissue, only later to be discarded, is ultimately disposed of in the same manner as the excess protein taken with food.

It is because of this fact that scientists are very slow in finding out the true protein requirements of the body. They formerly assumed that the amount of urea excreted by the kidneys indicated the amount of protein that the life processes really demanded. Hence their surprise and scepticism when it was discovered a few years ago that a man could live, and seemingly be the better for it, on from one-fourth to one-half of the amount of protein formerly thought necessary. The scientists had been particularly positive that the body required these larger amounts of protein, because, when the amount taken in the food was decreased to less than the accus-

tomed figure, the result was that more nitrogen seemed to be excreted than was being taken in the food. They reasoned that this nitrogen must come from the living tissue, and that the man was therefore consuming himself, and would ultimately waste away and die of starvation. The error was in the fact that the observations did not continue long enough. The extra nitrogen being excreted was derived from a sort of floating surplus, and when this was disposed of the amount of nitrogen excreted was reduced, or, as the scientists say, the nitrogen balance was re-established, and maintained on a lower level.

Excess protein is not only wasted in the sense that it is not utilized, but it wastes other food substances because it stimulates the rate of metabolism, or physiological change, and causes the rate of oxidation of the body to increase during its period of protein digestion and absorption. This effect of protein was only recently discovered, but it has now been shown that a man, after eating heavily of meat, will generate from ten to thirty per cent more heat for a period of six to eight hours after such a meal of meat than he would on an empty stomach. Excess protein therefore wastes other foods, as this extra oxidation does not serve any useful purpose.

Some scientists still argue that there is an

advantage to be derived in this wasteful and excess use of protein. These arguments, however, seem to be based upon the natural prejudice in favor of the maintaining of established habits. By the same line of reasoning, many people argue that the eating of all food in excess of our actual needs is a good thing, as it makes us "fat and prosperous" with a sort of surplus bank account of nutriment always on hand.

The fallacy of this view will be fully considered in our chapters on "How Much to Eat" and also in the chapter on "Eating to Reduce Weight."

CHAPTER IV

New Discoveries of Experimental Biology

BIOLOGY is the science of life. Very naturally, the subject includes physiology, and both subjects include chemistry. But in this chapter we will treat of the subject of human nutrition from what is known as the biological viewpoint. This particular knowledge, which is the newest knowledge we have in the field of food science, is called biological, not because the knowledge relates to life—for the older knowledge also related to life—but because the methods of gaining this recent knowledge have been those of biological research or experimentation upon animals.

To our earlier knowledge of foods and nutrition, the chemists made the greater contribution. They analyzed foods and determined what they consisted of. As physiological chemists, they likewise determined the composition of various tissues, fluids, and secretions of the body. From these studies, there was worked out a rather wonderful understanding of the complex life

processes. Yet that understanding was not complete. The chemist's test-tube is, at best, a poor imitation of the living organ or cell, and there were many facts concerning the life processes which eluded the chemist altogether.

Now the experimental biologist, though he may know chemistry, does not depend upon the test-tube as the chief source of his knowledge. Instead, he experiments on the animal. By this method of biological or animal experimentation many very important facts have recently been discovered.

These biological experimenters have discovered for us the existence of certain food essentials, sometimes called food accessories (which the chemists failed to discover). These substances are known as vitamines. They were not discovered by chemists because they exist in food in small quantities, and perhaps because they were destroyed by the chemists in the process of their food analysis.

It has been known for generations that a diet of artificial and preserved foods, especially a diet lacking fresh fruit, would cause a disease known as scurvy. The classic remedy for scurvy is the juice of citrous fruits. Fresh vegetables, such as cabbage, potatoes and tomatoes will also prevent or cure the disease. In fact, any mod-

erate amount of fresh, unheated fruit or vegetables, or the use of raw milk, will prevent scurvy. The disease usually occurs at sea, or in prison, or among soldiers fed dry rations. There is no excuse for its existence in a population that has access to natural foods.

Men subject to scurvy may have ample food containing sufficient carbohydrates, fats and protein and minerals—hence, so far as the chemists could determine, an adequate diet; and yet the food lacked something or was deficient, and this deficiency caused the disease. Whatever was missing was supplied in the fresh fruit juices or other foods used to relieve scurvy. I cite the example of scurvy first, as the disease and the means of curing it have been longest known.

As a matter of fact, the discovery of vitamines occurred through researches concerning beri-beri. This disease was at one time a terrible scourge in the Japanese navy, but existed elsewhere in the Orient among the poorer classes whose diet was simple and monotonous. It was discovered some years ago that the use of polished rice as a chief article of diet was responsible for this disease, and that it could be prevented by the use of unpolished rice, from which the natural bran and germ had not been removed. Here again, as in the case of the relief of scurvy with

orange juice, the addition of some food ingredient which had escaped detection by the chemists prevented the disease.

Scientists found that pigeons, if fed on polished rice or similar denatured cereals, developed a condition of paralysis known as poly-neuritis—a disease similar to beri-beri—and that the disease could be prevented or cured by adding rice polishings to the diet. The substance added, the exact chemical nature of which was unknown, was called a vitamine. By experimenting upon various foods it was possible to determine what foods contained this vitamine, and what foods did not contain it.

In the first edition of my book: "Strength from Eating," published in 1901, I gave an account of the feeding of pigeons upon a diet of pure starches, fat and carbohydrates. As I then reported: "These pigeons took their food regularly, but soon lost all liveliness and sat dumb and motionless on the bars of their cages. On the twenty-first day one of them had a fit, and both refused to eat. One died on the twenty-sixth day and the other on the thirty-first day, both from fits. . . . The nervous system was most affected, resulting in a sort of paralysis."

This experiment, reported by me several years before the discovery of vitamines, was evidently

a case of the poly-neuritis or paralysis now so commonly observed in pigeons and some other animals fed on denatured foods, and akin to the disease, beri-beri, in man. At that time I attributed the trouble to lack of mineral salts in the diet, for vitamines had never been heard of. As far as practical results are concerned I was right, for whatever may be the exact chemical nature of vitamines, in practice they are found to be usually absent from diets that are also deficient in minerals.

A third vitamine has been discovered by similar experiments. The absence of this third vitamine results in generally faulty nutrition, and specifically in a disease of the eyes known as Xerophthalmia. The substance which protects against this disease is known as the fat soluble vitamine. It is abundant in the fat of milk or butter or the fat of egg yolk, and in the fat of animal glands, such as liver and kidneys. It is not found in vegetable fats or oils. It is found, though in less abundance, in the leaves of plants, presumably associated with the green coloring matter.

These three vitamine are the ones best known. There is a fourth vitamin that was formerly confused with the fat soluble vitamin just discussed, because both are abundant in cod liver oil. Dr. McCollum of Johns Hopkins discovered

that cod liver oil that had been heated and oxidized to destroy its power to protect rats from Xerophthalmia still had ample power to prevent or cure rickets. Milo Hastings, of the Physical Culture Food Research Laboratory, also found that leg weakness in chickens, which is a form of rickets, could be prevented or cured by cod liver oil, but not by a super-abundance of green kale, though kale is rich in the fat soluble vitamin. These tests demonstrate the existence of a fourth vitamin known as the anti-rachitic vitamin, which is most abundant in livers, cod liver oil and egg yolk.

Another vitamin has been discovered at the University of California known as vitamin X, or the fertility vitamin. These scientists claim that even if all the other vitamins as well as minerals are supplied that fertility is still impossible without the fertility vitamin. It is present, however, in many natural foods, and at the present time we cannot say just how practical this discovery may prove.

The discovery of the vitamins has indeed been a great stimulus to research in all phases of nutrition. Those of us who had studied the food question from a more practical, human standpoint had observed much evidence of the superiority of natural foods. The discovery of the

vitamines backs, with scientific fact and theory, these more practical human observations.

The following account of an experiment in the feeding of rats will serve to show the method of these biological researches in food science. Rats were fed from weaning time on, exclusively upon a diet consisting of—

	Per cent
Bolted wheat flour	20
Degerminated cornmeal	10
Cooked and dried potato	30
Peas	10
Navy beans	10
Beets	5
Turnips	5
Cooked and dried beefsteak	10

This diet affords a sufficient variety of food and, for the rats at least, was entirely palatable. As far as chemical analysis can show, the diet seems to be nutritious and well balanced. Note that it is not exclusively vegetarian, but contains ten per cent of beef by dry weight. Since beef is about sixty per cent water, this would mean a considerably larger proportion, by weight, of fresh meat. From this proportion of meat, and the peas and beans, the rats unquestionably would derive sufficient protein. In short, according to the old ideas of food chemistry, this would seem to be a suitable diet for the growth and

sustenance of rats, which are omnivorous creatures whose nutritional needs are very similar to those of man.

Yet rats fed on the above diet did not thrive. In fact, they were barely able to maintain life at all and never grew to more than two-thirds their normal size. Even this growth was slow, and before the rats were one-quarter through the normal life-span of the species, these individuals were rough-looking and thin-haired and had all appearance of extreme old age. Such rats produced but few, if any young, and never succeeded in keeping these alive through the nursing period.

But when there was added to this diet about ten per cent of milk (by dry weight) the entire results were changed. This addition of milk makes the diet complete and wholesome, and the rats fed thereon grew rapidly, reached their full size, reproduced their kind, and lived out the normal span of rat life as healthy, well-nourished individuals. A similar improvement to the above diet for rats can be secured by the addition of leafy vegetables, such as spinach, cabbage, turnip tops, etc.

The chief deficiencies in the experimental diet is probably that of both the fat-soluble and the water-soluble vitamines and of mineral, particularly calcium, needed for bone growth. All

these elements may be supplied either from whole milk or from leafy vegetables.

The diet which proved so disastrous for these rats is not very different from the diet used by a great portion of our population. At least the bulk of conventional food is of a similar nature, consisting largely of refined cereal products, potatoes or other root vegetables and meat. That similar disastrous results do not occur more frequently in human experience is merely because the diet is not held rigidly to such foods, but includes at least some variety of fruits, leafy vegetables and dairy products or eggs.

The biological method of research by animal experimentation has thrown much light upon the importance of the various mineral salts. While the presence of these minerals in food was known to the chemists, they were not able to tell us in just what quantities they were needed, nor in just what form. Indeed, it is impossible for the chemist to find this out, for he changes the form of the minerals from organic to inorganic in the process of his analysis. By animal experimentation it is possible to determine what minerals are essential and from what foods they may best be derived. Indeed, this experimentation may be extended to human beings; thus, at the time of the present writing, the food experts of Colum-

bia University are conducting researches to determine the amount of calcium necessary for the proper growth of children. This calcium, needed for bone growth, can best be secured from milk. While no intelligent man, who was not poverty driven, would deprive his child of the milk needed for its growth, yet, among the poorer classes of our large cities, children are frequently stunted and diseased by just such deprivation. Therefore, the scientific determination of the quantity of milk needed will presumably be of importance in arousing legislation to protect these children.

A further fund of information which these biological experimenters have uncovered relates to the relative value of various protein foods.

In the previous chapters I have mentioned the fact that proteins are highly complex substances, composed of many similar but distinct chemical compounds known as the amino-acids. The chemists were able to discover these amino-acids and to determine the various percentages of each contained in the various proteins. But this information was of no particular use, because the chemists could not find out in what proportion the living body required these numerous substances.

It was here that the biological experimenters took up the problem by feeding experiments. They found out some surprising facts about the

relative value of protein from various sources. In one test, rats were given a diet complete and well balanced in respect of fats, carbohydrates, mineral salts and vitamines. To such a diet the protein from a single food would be given until an amount was found which was just sufficient to maintain the weight of the experimental animal. The following table shows the amount of protein from various sources needed to keep up such weight:

TABLE

	Per cent of the entire food
Milk protein	3
Oats protein	4.5
Corn protein	6
Wheat protein	6
Rice protein	6
Flaxseed protein	8
Bean protein	12
Pea protein	12

A somewhat similar experiment was conducted in feeding young pigs; but in this case the protein was supplied in abundance and the amount retained or converted into living tissue by the pigs was determined. The figures are as follows:

TABLE

	Per cent
Corn protein	20
Wheat protein	23
Oat protein	26
Milk protein	63

These results show how dangerous it is to depend upon chemical analysis alone in matters of food science. From both experiments, the great superiority of milk protein was revealed. We also observe beans and peas were not so highly rated as sources of protein, really not supplying any more net protein to the body than the cereals, which the chemist tells us contain only about half so much protein, but which the biologist finds to be twice as well utilized.

Although the data is not available in regard to all foods, we have sufficient facts to warrant us to believe that the natural animal foods—milk products and eggs—supply the highest grade of protein. The protein from meats is more available than that from vegetables, but there are other objections to meat that do not apply to milk and eggs. Of proteins of vegetable origin, we have reason to believe that the best are derived from the active growing cells of plant life, rather than from the stored protein in the dried seed. Those seeds which contain the greatest quantity of protein seem to have protein of the poorest quality, and it is, therefore, a mistake to attempt to derive our protein from beans, peas, nuts, etc. We need little protein; hence we should get it from the very best sources, and these are unquestionably milk, cheese and eggs.

CHAPTER V

What to Eat

IN this chapter we will consider the dietetic values of various foods. Our estimate of the worth of various foods, or groups of foods, will take into consideration all scientific facts discussed in the last three chapters, that is, the chemical analysis, digestibility and effect upon the digestive action, and also the question of the presence or deficiency of vitamines, etc. But in this chapter we will consider the foods for their qualitative worth only. The questions of proportioning the food, and of the total quantity of food to be used will then be considered in the two chapters that follow.

In considering the entire list of human foods, the simplest and most natural grouping or division is that of animal versus vegetable foods. The question of vegetarianism is indeed the oldest, and has been the most discussed of all food problems. Modern scientists insist that man is omnivorous—that is, that he can eat and can, if necessary, live on either vegetable or animal foods, or a combination of the two. In this re-

spect he differs, on one hand, from such species as the cow or horse, which are obviously vegetarian; and on the other hand, from the lion or wolf, which are strictly carnivorous. Man shares this omnivorous habit with many other species. To mention familiar examples: the rat, the pig and the chicken.

Man, like other omnivorous species, has teeth and digestive organs that are intermediate between the strictly vegetarian and the strictly carnivorous species. Many students of the subject, have, however, questioned the fact that man is naturally a meat-eating animal. They hold the view that his teeth and digestive organs are adapted to a diet of fruits and nuts, which are unquestionably the chief items of food eaten by man's nearest kin, the apes, and therefore, presumably, by man's ape-like ancestors. These two views are not as divergent as they may at first seem, for most apes probably add to their nut and fruit diet birds' eggs, and perhaps some insects and lizards.

All things considered, we are safe in assuming that man's natural diet was predominantly a vegetarian one, with a smaller proportion of foods of animal origin. The two chief changes in the diet of civilized man are the inclusion of meat from larger animals, and hence in larger

quantities, and the use of grains or cereals. Neither of these types of foods which make up the bulk of man's present diet was available to his ape-like ancestors. The use of weapons and of fire accounted for the addition of meat, and the development of agriculture and devices for the harvesting and milling of grain made possible the second addition. Such resources greatly increased the total foods available for man, and largely accounted for the increase of the species, and the establishment of the human animal as the ruler of the earth.

It does not follow, however, that the diet consisting chiefly of meat and grain is the most wholesome and beneficial diet that man can use. Indeed, present-day scientific knowledge indicates that such a diet is not the best, and that while it has advantages of economy, its use has only been possible because it has been supplemented by animal products, such as milk and eggs, and by a considerable variety of vegetable foods other than grains.

No one today among civilized men advocates an exclusive meat diet, except where prescribed for the treatment of consumption and other diseases. Indeed, no men have ever existed upon it, except the Eskimos, and their rather miserable existence has been possible only by the abundant

use of the internal organs of animals—a diet which no civilized man would care to adopt. The meat diet may have advantages to the Eskimo not only because the fat gives him large quantities of fuel to keep him warm, but because lean meat stimulates the rate of heat production in the body during the process of its digestion.

On the other hand, many races and groups of men have existed upon an exclusively vegetarian diet. The consensus of opinion today is that the best diet for man is what is known as the lacto-vegetarian diet, that is, a diet consisting of foods of vegetable origin, supplemented by milk (and milk products), or milk and eggs.

Moderate quantities of meat foods may be used in the diet without materially changing its effect. And remember that lamb, veal, and pig of all kinds should especially be avoided. When you actually need meat, beef is probably the best kind to select, though mutton can sometimes be recommended. My favorite meat is the top cut of "round" steak ground up and boiled for one or two minutes in a few spoonfuls of water or until the red color disappears. It is also palatable broiled. Chicken and fish are also desirable meats, but not as nourishing as beef.

Meat, however, is inferior to milk and eggs in most cases—there are exceptions. Both groups of

food supply growth–proteins of superior quality to those derived from any vegetable foods, but meat is deficient in minerals and in vitamines. A diet consisting of a goodly variety of vegetables, including an abundance of green leafy vegetables, and containing a small proportion of meat, will support life without the use of milk. This indeed is the type of diet upon which Chinese and Japanese have subsisted for centuries. Population is too congested in those countries to permit of the keeping of dairy herds; they do, however, keep poultry, and hence eat eggs. But this Oriental diet is not equal, especially from the standpoint of the nourishment of children, to the diet available in dairying countries. Recognizing this fact, the Japanese Government has made every effort to increase the dairy industry in their crowded land, and in lieu of their inability to produce sufficient milk, the Japanese import condensed milk from other countries.

Meat adds no essential food values that can not be derived more cheaply from other sources if the digestive organs are normal. As used in the conventional American diet, meat supplies entirely too much protein, which sometimes results in overburdening the excretory organs with nitrogenous waste products. Moreover, meat con-

tains the waste products of the animal and these substances are very similar to the waste from human cells, though with a healthy digestion this is easily eliminated in the alimentary canal.

For the further consideration of foods of vegetable origin, we can divide them in the following groups:

Grains and Grain Products
Roots or Tubers
Leafy Vegetables
Fruits
Nuts
Extracted Oils
Extracted or Manufactured Sugars

All of the above groups of foods are wholesome and may be included in the diet, but they are not equally complete, or of equal dietetic worth. Some of these foods, while harmless if used in moderate quantities and in proper combination with other foods, result in a seriously deficient diet if used in such proportions as to crowd out other groups.

Because of the mistakes of flour manufacturers all grains and grain products could be entirely eliminated from the human diet, and thereby decrease the danger of dietetic deficiencies and inadequate nutrition. But it is difficult to do this because grains and their products supply the great bulk of human food. Indeed it would not

be possible, without revolutionary changes in our agriculture and food producing methods, to support the human race without the use of grain.

Grains are the seeds of various grass plants. The bulk of the substance of all grains is starch. Together with this starch is incorporated from eight to fifteen per cent of vegetable protein. This protein we will ignore in the present discussion as it is not of a very high order of nutritive value and better protein may be derived from other sources. The starchy substance of grain may be ground up to produce flours and meals which keep well and which are the basis of our bread-making and baking arts. In addition to this starchy portion, which fills the endosperm or bulky interior of the grain, all grains have an outer coating of bran, and also a germ. The milling industry adopted the practice of removing both bran and germ. There were several reasons for this. In the first place, the bran and germ cannot be ground as fine as the starchy interior of the grain. Also, they are usually darker in color. Therefore the inclusion of the bran and germ produces a coarser, darker flour. The refined flour from which these elements of grain have been removed is whiter and finer and, incidentally, will make a lighter, airier loaf of bread. Such a flour appealed to the fastidious

taste of the housewife; hence as they developed machinery with which to manufacture it, the millers vied with each other in the production of the whitest, finest flour possible. Another reason that favored the production of this super-refined flour was that the exclusion of the germ made the flour of better keeping qualities. The germ contains a small proportion of oil, and if the flour was stale, this oil became slightly rancid, giving the flour a strong flavor.

In the manufacture of degerminated cornmeal, both the bran and the germ are removed. While rice is never ground, this same idea of a white and seemingly pure product resulted in the development of the process of polishing, in which the bran and germ are rubbed off the grain.

In all these cases, the removal of the bran and germ results in a serious loss in nutritive values. The interior white portion of the grain is almost entirely devoid of minerals and vitamines. These are more abundant in the bran and germ; moreover, the bran, especially in the case of wheat, is exceedingly valuable to give bulk to the diet and prevent constipation or intestinal congestion.

If white flour and similar denatured cereal products were used only in small quantities and combined with ample quantities of milk and green vegetables, it is probable that no serious

harm would come from their use. But, as these cereal products, in the form of bread and other bakery goods usually compose a large portion of the diet, a denaturing of the grain in the milling process is a very serious evil. Even though the use of the denatured product might be tolerated with the precautions above mentioned, the discarding of the bran and germ is a serious economic waste, for it must be replaced with similar nutrients from other and more expensive sources.

By all means, I heartily advise the use of whole wheat and whole wheat products, of cornmeal made from the whole grain, and of unpolished rice. These natural cereal products contain the coarser fibre substance of the bran, and the minerals and vitamines of the germ, and are unquestionably more nearly complete foods than the refined products. Used with whole milk or milk and butter, the entire grain cereals, particularly wheat, make a practically complete diet. Such a combination is one of the cheapest and most palatable diets possible and may be safely used as the basis or bulk of any low-cost diet.

In cases where there is too much fermentation in stomach and bowels, bread of any kind is often troublesome. This is especially true where there are catarrhal conditions of nose, throat and lungs. And this reference applies more particularly to

breads made of yeast or other similar ferments. Unleavened bread is not so objectionable, though a diet devoid of breads of any kind is often desirable in cases like this. Zwieback can be excepted, as its fermentative elements are destroyed in the prolonged cooking process to which it is exposed.

Roots and tubers, of which the potato is the most used, are somewhat similar to grain in composition. In either case, the bulk of the food material is starch—or, in the case of beets and sweet potatoes, starch may be in part replaced by sugar. But the root vegetables are moist, and contain from seventy-five to eighty-five per cent of water. If roots are dried, they then become quite similar in composition to dry cereal products.

The natural roots contain considerably more minerals than do the refined cereals. The proportion of the various minerals are different in different root vegetables. Turnips, for illustration, are very rich in calcium. Taken as a group, the root vegetables are equal or superior to whole wheat as a source of minerals. Like the grains, the root vegetables are devoid of the fat-soluble vitamine which is found in butter or milk fat, in the egg yolks and in green leaves. The addition of potatoes or other root vegetables to

a diet of grains and meat does not, therefore, make the diet complete.

The root vegetables should by all means be used in the diet in moderate proportions. They supply cheap and nourishing fuel food in the form of starch and sugar combined with fibrous or cellulose matter, and a variety of mineral salts. The fact that such vegetables are marketed in a moist condition makes them palatable, and permits of their being cooked and served in a variety of pleasing and tasty ways. Moreover, the millers have not gotten in their work of refining them and removing their more valuable ingredients.

The leafy vegetables have many attributes to recommend them. On the whole, present scientific knowledge rates them as the most essential foods known, with the exception of milk and eggs. This does not mean that leafy vegetables would do as the whole diet of man. Indeed, they are so bulky that a man would have difficulty in eating enough of them to sustain life. But their use to supplement other foods and prevent the deficiencies of our conventional foods cannot be too highly recommended.

The essential qualities of leafy foods are: first, the vitamines, all of which seem to be present in leaves; second, the minerals, in which leaves are very rich; and third, in the presence of cellulose,

which gives bulk to the food in the same way that wheat bran does. Leaves are also richer in protein than grains or roots, and this protein is probably more available than the stored protein of dry vegetable food.

As an illustration of the mineral value of leaves, spinach contains more phosphorus, calcium and iron in proportion to its other food ingredients than any other food of which we have the analysis. Lettuce ranks as a very close second. Cabbage, in which the leaf is not quite so active, has only about half as much mineral as spinach. But all these leafy foods out-rank in their proportion of mineral ingredients any of the foods derived from grains, fruits, nuts or meat. They are equalled only by milk, cheese and eggs.

It does not, of course, follow that all leaves are suitable for human food. The leaves usually used are the tender leaves of quick-growing vegetables. The leaves of trees usually contain tannin or other substances that are either unwholesome or unpalatable. Leaves may also have too much cellulose or fibre to be palatable. For this reason we prefer the quickly grown tender leaf and have selected for garden cultivation the tender and more tasty varieties. Tea leaves are an illustration of the use of a leaf as a

food which is hardly in keeping with the recommendations of leaves here given. The tea leaf is nearly as strong in tannin as the oak leaf and, like the coffee berry contains an alkaloid narcotic peculiar to the species.

The edible leaves, in their fresh condition, contain large amounts of water. Hence, they should not be valued too highly per pound, as it is only the dry weight that counts as food. However, as leaves are not to be relied upon for the fuel supply of the diet, this watery condition or low calory rating does not count heavily against them.

The high value of leaves as food is attributed to the fact that they contain the active, growing cells of the plant. This same thing is true of buds and very tender shoots, or of seed-pods in the immature stages of development. Thus asparagus tips and string beans may, for practical purposes, be considered in the leafy vegetable group of foods. Some of these same attributes are found in the immature green corn or green pea.

There are a few vegetables in which the portion used as food consists of a tender stalk. For illustration: celery and rhubarb, or pie-plant. These tender stalks rank between the root vegetables and the leaves in food quality.

There are a few foods classed as vegetables

commercially which botanically rank as fruits; such as melons, tomatoes, cucumbers and the egg-plant. Melons have no particular food value; they consist chiefly of sugar and water. The cucumber is about as devoid of food value as any substance eaten by man. The pulp of pumpkins and squashes ranks somewhat lower than the poorest root vegetables. The value of the pumpkin pie is in the milk and egg.

The tomato, on the other hand, is a distinctive and valuable food, being rich in minerals and in organic acids.

Fresh fruits, considered for the food substance contained, are the most expensive of all foods. This expense is due to the fact that fresh fruits contain very large quantities of water. Dried fruits are of much greater value per pound. Such foods as dates, figs, raisins and prunes, even considered from the standpoint of their caloric or fuel value, are worth nearly as much as dried cereals. In all other attributes they excel cereals. In the first place, their fuel substance is in the form of sugar, and this natural sugar, unlike that from the cane or beet, is already in the form in which it may be absorbed directly into the blood; hence, is less likely to ferment in the digestive organs. Secondly, fruits contain minerals which are absent from refined sugar. Fruits

also contain a proper amount of fibre or cellulose which aids digestion. Lastly, fruits contain organic acids which, strange to say, actually prevent an acid condition of the blood. This seeming contradiction is due to the fact that the organic fruit acids are really acid salts formed of a combination of organic acids with basic or alkaline minerals. In the process of digestion and assimilation, the organic acids are oxidized, freeing the alkaline salts for new combinations which serve to neutralize the harmful acids developed by the physiological processes.

The vitamine content of fruits has not been fully investigated, but we know that the juice of limes or oranges is a remedy for scurvy, and we may safely assume that fruits contain the water-soluble vitamine. Fruits are probably deficient in the fat-soluble vitamine, which seems to be supplied in abundance only from milk or egg fat, or from green vegetables.

No scientific consideration of the subject can fully portray the dietetic value of fruits; for above all other foods, their value lies in the flavor or appetizing quality, and the consequent pleasure to be derived from their use. Fruits are the natural dessert and should be used as such. With the possible exception of dates, figs and raisins, fruits are not to be considered as suitable for

forming any great bulk of the diet, or replacing other food groups. But these sweet fruits may be very profitably used in the place of artificial sugars, and also to cut down the quantity of cereal starch.

Nuts are botanically similar to grains or dried legumes in that they are the seeds of plants. We, therefore, assume the nut to be deficient in vitamines and minerals as are other seeds; but nuts differ markedly from grain in that the stored fuel food is predominantly in the form of fat instead of in starch. This makes the nut about twice as valuable, even as a source of fuel. A certain portion of fat is necessary in the diet as a matter of palatability.

Nuts have played a prominent part in all vegetarian menus. The high rating so given them was originally due to the fact that they are the richest in protein of any vegetable foods, with the possible exception of beans and peas. From our present knowledge we do not rate this protein so highly, both because we now realize that the body does not need so much protein, and because we now know that vegetable proteins are not as assimilable by man as protein of animal origin. Thus it would seem that our recent knowledge indicates that we formerly placed too high a value upon nuts. This much may still be said in their

favor: the nut protein is free from any of the toxic waste products that may be present in flesh foods. Also the fat of nuts is exceedingly nutritious and wholesome and has a decided advantage from the standpoint of digestibility over the animal fats which are used in frying or in the making of pastry.

Nuts should be used in the diet as a food, not as a relish; that is, they should be a part of the meal and not taken in addition to the meal. Nut meats should be thoroughly masticated, as they are not digestible when swallowed in large particles.

While nuts are not essential to the diet, they are a pleasing and tasty food and may be very profitably used in moderate quantities, especially in those diets from which meats and animal fats are eliminated.

Extracted fats or oils, whether of animal or vegetable origin, have no food value whatever except as a source of fuel. In this respect, pure oil is worth about two and one-quarter times as much as sugar, or two and one-half times as much as dry cereals. No diet is palatable and presumably is not wholesome without some proportion of fat. The best source of fat in food is in the form of the emulsified fat of milk, cream or egg yolks—or in a somewhat more concentrated

condition in butter and cheese. In all these cases the fat contains the highly important fat-soluble vitamine which does not exist in such fats as lard, cotton-seed oil or oleomargarine.

The second preferable form of fat is that of nuts. The amount of extracted nut fat to be used in the diet will depend upon the amounts used in the above-mentioned and preferred forms. I should say that, in a meatless diet, the use of milk, butter, eggs and nuts would supply all the fat actually needed, but that an additional amount may be used in the form of oil, either alone or combined with other ingredients, as salad dressings.

Where fat is used in all the above-mentioned forms, the additional use of fat in the frying of foods or in the concocting of rich pastries is a wasteful and harmful habit. In the first place, such additional fat is not needed and is therefore inclined to over-enrich the diet and lead to over-eating. Secondly, the combination of fat with starch and sugar, either in frying or when mixed with the ingredients, results in a product which is notoriously difficult of digestion. Thirdly, such fats are absolutely devoid of minerals, proteins and vitamines, and hence their use increases the danger of deficiency of some of these most essential elements.

All that has been said about the surplus use of fat in cooking applies to the use of fat meat. It has nothing to recommend it at all, except that of being a source of fuel energy in a most concentrated form. Its use may be excusable in the diet of the Eskimo, or other men doing severe work in rigorous climates, but for the ordinary American, especially if he be an indoor worker, the use of fat meat or excessive fat in any form is a dietetic evil.

Many of the arguments above given against the use of fat apply to the use of ordinary commercial sugar. In the plants from which sugar is derived, it is at least combined with mineral salts, cellulose and the water-soluble vitamines. But in the refining process, all these elements are discarded and we have chemically pure sugar. We have reason to believe also that sugar in itself is not a very wholesome food, but the chief trouble is that we add it to a diet of refined cereals, meats, potatoes, and refined fats, all of which are already deficient. This addition of sugar merely results in increasing the proportion of such deficiency.

If any one of the deficient foods enumerated in this chapter were the sole offender in a diet otherwise made up of natural foods, there would be little occasion for concern over its use. But when

the millers rob us of the minerals and vitamines of our grains, and we then add large quantities of refined fats and sugars, the danger of food deficiency is very real. It may be possible to protect against such deficiencies by the use of milk and green vegetables, but the wiser plan would be to use also natural whole grain products, and to cut down the quantity of refined fats and sugars to the minimum amount necessary to prepare our food in palatable form. Even this last suggestion is merely a concession to convention, for it is entirely possible to select a diet containing dairy products, nuts and sweet fruits from which refined fats and sugars may be eliminated altogether.

CHAPTER VI

Balancing the Diet

IN addition to knowing which are the better foods to use, it is important that we should have some idea of the proportions in which to use them and how to combine them into tasty menus which shall also form an adequate or complete diet.

The most common fault in the American bill of fare is the over-use of meats, denatured grain foods (including breads, pastries and "cereal" dishes), potatoes, and refined sugars and fats.

The simplest remedy for this fault is the decrease of the foods mentioned, and the increased proportions of milk, butter, cheese and eggs and of leafy vegetables. The increased use of natural whole cereals, fruits, nuts and a general assortment of vegetables, while not so important as the milk and greens, is generally beneficial and advisable.

Any menus prepared with these facts in mind will not be far wrong.

In considering the subject of proportioning and combining the foods, we should distinguish

between the matter of food combinations in a single dish or a single meal, and the question of the combinations or proportions of various foods in the general diet over longer periods.

Our reasons for considering the more immediate combinations are either a matter of taste and palatability or a question of the digestibility of foods eaten together, or eaten at the same meal. This question of immediate combination of foods has little to do with the balancing of the diet as a whole. The body has power to store the various elements of nutrition for a considerable period; therefore it is not necessary that we use all essential groups of nutritive elements in the same meal, or even in the same day. A breakfast made of sweet fruits and nuts, a dinner with an ample proportion of green vegetables, and a supper with an adequate quantity of milk would be more satisfactory from the standpoint of nutrition than if all these food groups were included in each and every meal. The digestion would be better, due to the simplification of the meal, and the fact that the digestive ferments would have fewer kinds of substances with which to deal.

On the question of the exact combinations of food ingredients in each meal we have very little definite knowledge. Even some of the views generally held on this question are without scien-

tific foundation. Thus we are almost invariably told that one should not eat acid fruit with milk. The prejudice against this combination arises from the fact that milk mixed with an acid is curdled, producing a product of unattractive appearance and which is supposed to be indigestible. As a matter of fact, milk is invariably curdled in the stomach by the hydrochloric acid. Hence its mixture with the milder fruit juice only anticipates this step a little and probably does not affect the digestibility at all.

Another combination against which we are sometimes warned is that of acid fruits and starches. There is a little more scientific theory to back this teaching. Starch is only digested in an alkaline medium, and hence the addition of acid in the food may interfere with its digestion. Even in this case it is probable that, in a healthy digestive tract, the acid is over-balanced by the stimulation of an extra section of alkali, and hence the matter is automatically righted.

The question of immediate combination foods must rest, more or less, with the individual and his personal observation of the ease with which he digests various combinations. If he finds that a particular dish or food combination gives him digestive trouble of any sort, it is best either to eliminate the trouble-giving foods altogether, or

to seek out simpler ways or simpler combinations in which to use them.

Individuals differ greatly in their digestive capacity, and in their susceptibility to digestive troubles because of various foods or food combinations. There are some dishes that are notoriously indigestible, such as mince pie, plum pudding or pig's knuckles and other heavy, "rich" dishes. These will naturally be avoided by any careful person. But with simpler and more wholesome dishes, such as are advised in this book, the question of immediate food combinations need not trouble you, unless from personal experience you find that they give you distress.

The two following menus, both of which include meat foods, will illustrate the difference between an unbalanced or deficient diet and a balanced or adequate one. Three meals per day are presented because of conventional requirement, but my own personal requirements consist of one or two hearty meals daily, though the number of meals daily is entirely a matter of habit, and is not of great importance, provided one does not eat without appetite, merely because it is meal time, and does not eat beyond his digestive capacity. It is the quantity and quality of the diet, not the meal plan that is important. This is dealt with more fully in later chapters.

A DEFICIENT MENU

Breakfast

Oatmeal with cream and sugar
Hot cakes with glucose or sugar syrup
Sausages
Coffee

Dinner

Roast Beef with gravy
Mashed Potatoes
White Bread and Nut Margarine
Canned Corn
Apple Pie

Supper

Beef Broth with Crackers
Salmon Patties
White Bread with Nut Margarine
Rice or Tapioca Pudding
Tea and Cakes

AN ADEQUATE MENU

Breakfast

Whole Wheat Bread or Muffins
with Honey and Dairy Butter
An Orange, or Soaked Prunes with Nuts
Cocoa or Cereal Coffee with plenty of Cream
or Rich Milk

Dinner

Kale or other Greens
Eggs or Beef or other meat
Corn Bread and Butter
Pumpkin Pie
Cereal Coffee

Supper

Cream of Celery Soup
Salmon and Lettuce Salad
Whole Wheat Bread and Dairy Butter
Fruit Gelatine Dessert
Grape Juice Punch

The first of these menus is over-supplied with denatured cereal products and utterly lacking in green vegetables. A hard working man able to consume large quantities of such food might exist on it, even without the addition of milk. For a growing child or a person of sedentary occupation, the diet would be unsafe. Even the addition of milk, while it would help somewhat, would still leave the diet devoid of bulky vegetable fibre, which fact would probably produce constipation; moreover, the body's craving for missing elements would likely lead to over-eating and consequent obesity.

When using milk also carefully note that sweet milk does not combine very well with meats, cooked eggs or some cooked vegetables. It is better to make milk a large part of a meal when used, and combine sweet or acid fruits with it. Dates or raisins are ideal with it, though prunes, figs or other sweet fruits can be recommended.

Soured milk products will combine satisfactorily with nearly all foods.

When digestion is normal vegetarian diets are generally safer than meat diets because the absence of meat usually results in the eating of a greater variety of fruits and vegetables in an effort to gain palatability. But it is very easy for a vegetarian diet also to be inadequate for

complete nutrition if large quantities of cereal starches are used. The following two examples will illustrate the difference between a deficient and an adequate vegetarian menu:

A DEFICIENT VEGETARIAN MENU

Breakfast

Cream of Wheat (Farina) with Sugar and Milk
Fried Mush with Syrup
Stewed Prunes
Cereal Coffee

Dinner

Bean Soup with Crackers
Baked Potatoes with Nut Butter
Bread Pudding

Supper

Macaroni with Tomato Sauce
Stewed Carrots with Cream Sauce
Nuts and Raisins
Fruit Punch

AN ADEQUATE VEGETARIAN MENU

Breakfast

Oranges
Whole Boiled Wheat with Nuts and Raisins
Milk

Dinner

Bean Soup with Whole Wheat Bread
Cabbage or Cauliflower dressed with Butter Sauce
Macaroni and Cheese

Supper

Mush, made of Whole Ground Corn and served with plenty of Milk
A Lettuce-Fruit Salad

The first of the above named menus contains entirely too much cereal food, and that cereal in a denatured form. The use of nut butter and fruits and vegetables given will not protect such a diet from deficiencies. The second diet is equally simple and inexpensive. By the inclusion of milk, butter and cheese and a little leafy vegetables the menu becomes a safe one.

The following simple rules will summarize the principles we have been considering and will serve as a guide for the selecting and proportioning of foods in the planning of menus.

The use of too much milk with other foods will at times make one more liable to colds and the various diseases that begin with symptoms of this nature, though milk will always insure a satisfactory quantity of nourishment. Some use a quart of fresh whole milk a day for each member of the family. This is usually too liberal a portion though it will cover a multitude of other possible defects in the diet, provided there is no tendency to colds. It is given as a safe minimum, especially for growing children, in case other foods of the milk group are not used. If dairy butter, eggs, and cheese are used liberally in the diet, the quantity of milk per person may be reduced to a pint or less a day. But growing children should have their full allowance of a

quart of fresh whole milk and consume correspondingly less of other foods if you are not sure they are being thoroughly nourished with other foods. With my own children, when I give them a liberal quantity of milk they are given fruit only (acid or sweet) with it. Raisins and milk or dates and milk is a favorite meal. When giving them a hearty meal composed of a full variety of foods I rarely give them milk. It is not desirable, and they do not need it at such times. For milk used in cookery, canned or evaporated milk may be substituted for the fresh, the equivalent ratio being a pound can of the evaporated milk for a quart of the fresh.

Use at least one dish of leafy vegetables per day—or better still, one cooked dish of such vegetables and one of uncooked salad. Do not merely use a few leaves of lettuce or sprigs of parsley and call it a leafy salad; use ample quantities of lettuce or other salad greens, combining with other ingredients desired to give variety and flavor.

The problem of getting leafy vegetables in all markets at all seasons of the year is sometimes a vexatious one. On northern farms or in small towns there are often few leafy foods available from November to May. Cabbage and celery, however, are leafy foods which keep well in the

winter. Kale, which should be more grown, has wonderful frost-resisting powers, and will stay green through the winter in all but the most severe climates. In large city markets, even in the North, kale, spinach and lettuce are on sale throughout the winter. If, for a time, no fresh leafy vegetables are available, use canned spinach, canned string beans, and an abundance of general fruits and vegetables.

Use whole grain products in both breads and cereal dishes. This rule can be departed from, in part, where the diet is adequately protected otherwise, as here advised. White flour has some uses in cookery, for which whole wheat flour cannot be easily substituted. There is no excuse, however, for the use of the devitalized white flour bread in any diet unless you are suffering from chronic diarrhea; then it may be advised for a short time. Moreover, once you have found where you can buy, or learn to make a good quality of whole wheat bread, you will find that you prefer it to the white variety. The same is true of whole cornmeal and of unpolished rice.

Use sugar sparingly. Instead, use more sweet fruits, honey, and, if possible, maple syrup. Honey is the easiest of all sweets to digest, provided its nourishing elements are needed by the body.

If you use meat at all, learn to use it as a flavor food and not as a filling food. A quarter of a pound per person per day is usually an ample quantity.

Use nuts, if you wish, in the place of meat. Not that they are specifically needed as a meat substitute, but rather that nuts used in cookery will produce many delightful dishes and, therefore, reduce the temptation to use meat because of habit or appetite. But to use large quantities of both nuts and meat is foolish. It unduly enriches the diet in protein and fat.

Use vegetable oils in salad dressings and in cooking operations that require fat. Do not use vegetable oils or nut margarines as a substitute for dairy butter, except in menus containing very considerable quantities of milk, or of milk and eggs, or milk and cheese.

Use as much fresh fruit as you can reasonably afford.

Use beans, peas and macaroni—so-called meat substitutes—as you would use rice or hominy. These foods are tasty, but have no superior value over similar filling dishes derived from grains.

A very practical way to check up on the proper proportioning or balancing of the diet is by "balancing the grocery bill." This is only an approximate method, to be sure, and no absolute

rules can be laid down because of the wide variations of food prices with locations, and from year to year or season to season. Notwithstanding these wide variations in price the summary of the grocery bill with the items classified by groups will generally show whether the diet is approximately correct or seriously unbalanced.

The following food lists will illustrate this method. They may be taken as the grocery bills of two families, each consisting of a man and wife and two half grown children. The prices are those prevailing in New York City at the time this book is being written, and while these prices will not be good for any other place and time, yet the relative prices will not be very far off. In both lists the weekly bill comes to just about ten dollars and both lists contain approximately the same fuel value or effective food quantity.

A BADLY BALANCED GROCERY BILL

Whole fresh Milk, 7 quarts @ 15c $1.05
Evaporated Milk, 3 cans @ 12c ..... .36

Milk Group, $1.41

Meat, 9 pounds @ 30c ..... *Meat Group,* 2.70

Oleomargarine, 2 pounds @ 30c ..... .60
Lard, one pound @ 25c ..... .25
Sugar, 3 pounds @ 10c ..... .30

Oil and Sugar Group, $1.15

Potatoes, 10 pounds @ 4c	.40
Sweet Potatoes, 2 pounds @ 5c	.10
Onions, 3 pounds @ 4c	.12
Root Vegetable Group,	$ .62
(None used) *Leafy Vegetable Group,*	$ .00
Bananas	$ .20
Canned Fruit	1.00
Fruit Group,	$1.20
White Bread, 14 loaves @ 10c	$1.40
Oatmeal and Breakfast Foods	.50
Cakes and Pastry	1.00
Grain Products Group,	$2.90
Total Bill	$9.98

A WELL BALANCED GROCERY BILL

Whole fresh Milk, 14 quarts @ 15c	$2.10
Evaporated Milk, 5 cans @ 12c	.60
Cheese, full cream, 1 pound @ 40c	.40
Butter, 1 pound @ 50c	.50
Eggs, 1 dozen @ 50c	.50
Milk Group,	$4.10
Meat, 3 pounds @ 30c	$ .90
Nut Meats, 1 pound @ 70c	.70
Meat Group,	$1.60
Vegetable Oil, 1 pound @ 30c	$ .30
Sugar, 1 pound @ 10c	.10
Honey, 1 pound @ 25c	.25
Oil and Sugar Group,	$ .65

Potatoes, 5 pounds @ 4c	$ .20
Onions, 3 pounds @ 4c	.12
Carrots, 2 pounds @ 5c	.10
Beets, 3 pounds @ 5c	.15
Root Vegetable Group,	$ .57
Cabbage, 5 pounds @ 4c	$ .20
Lettuce	.30
Celery	.20
Spinach or other greens	.15
Leafy Vegetable Group,	$ .85
Dates, Raisins or Figs, 3 pounds @ 20c	$ .60
Oranges	.25
Other fresh fruit	.25
Fruit Group,	$1.10
Whole Wheat Bread, 7 loaves @ 10c	$ .70
Navy Beans, 2 pounds @ 10c	.20
Rice, 1 pound	.15
Whole Wheat as cereal, 4 pounds @ 3c	.12
Grain Products Group,	$1.17
Total Bill	$10.04

A study of the two grocery bills given above will show that the heaviest items of the first badly balanced bill are the meat group and the grain products group.

The milk group is insufficient. At the prices of milk given such a deficiency might be made

with a view of economy, but such economy is lost by the introduction of the larger meat item, and the use of canned fruits, cakes and pastry.

The second bill has a large, and, at these prices, seemingly extravagant expenditure for the foods of the milk group. But the total expenditure for all foods is approximately the same and both bills furnish approximately the same amount of food value as measured in calories. The well-balanced grocery bill gives us more variety and should be more appetizing for all those not hopelessly wedded to the use of meats and pastries.

The chief distinction that we wish to point out by these two illustrations is not a matter of either economy or tastiness in the diet, but the difference between the complete versus the inadequate diet. With the first bill there would be serious danger of deficiency of vitamines and minerals, while the second bill has abundance of both.

Because of the variation in food prices we cannot give an absolute rule regarding the percentages of the total cost of food that should be expended for each food group. The following general rule will, however, be helpful.

The expenditure for the milk group, including butter, cheese and eggs, should be by far the greatest item. The expenditure of an amount equaling thirty to forty per cent of the total food

bill upon foods of the milk group will do much to safeguard the diet against deficiencies.

The expenditures for grain products need not be over ten or fifteen per cent of the total bill; this is only possible, however, when cakes and pastries and the fancy breakfast foods are omitted and grain products are used in simple, natural forms as whole-grained cereals or simply and preferably as whole-grained breads.

There is no need for any of the five remaining food groups occasioning an expenditure of more than fifteen per cent of the total bill; of these, usually the meat and fruit will be the greatest. Vegetables should not run over twenty per cent of the total bill, and the amount may be kept at much lower than this, except during the winter season in the large cities; then the necessity of securing sufficient leafy vegetables may run this item up until it compares with the cost of fresh fruits.

If the expenditures for any one of the seven food groups do not vary over five per cent from the amounts given below, the diet may be counted on to be safe and well-balanced. Those who are confused by percentages may merely consider the items in this table as the number of cents to be spent for each food group out of each dollar of the total food bill.

APPROXIMATE PERCENTAGES OF EXPENDITURE FOR EACH FOOD GROUP

	Per cent
Milk Group	35
Meat Group	15
Oil and Sugar Group	5
Root Vegetables	10
Leafy Vegetables	10
Fruit	10
Grains	15
Total,	100

Obviously this table is made up for city people. Those living on farms will be able to secure the foods from some of these groups at little cash cost; and attempting to calculate the proportions on a farm cost basis would upset the balance of the diet. If you live on a farm you should be able to secure an adequate diet more readily and more cheaply than the city dweller. Yet the fact remains that the farm diet is often badly balanced and lacking in the items of the milk, leafy vegetables and fruit groups. These highly essential foods, for which the city man must pay what to the farmer would be exorbitant prices, are part of your compensation for living away from the bright lights and superficial pleasures of city life. When you fail to make use of the health-giving elements of country life, you lose out all around.

CHAPTER VII

How Much to Eat

IN Chapter II, I discussed briefly the subject of calories. There is no occasion for figuring the number of calories in one's food from a practical standpoint of eating for health and strength. However, we cannot consider the scientific data and records of experiments that throw light on that question of how much to eat without use of the term calory.

One of the earliest lines of research in food science was the effort to formulate dietary standards. The method of doing this was the keeping of records of the quantities of foods eaten by various groups and types of people. With the kinds and amounts of food known, it was easy to figure the total number of calories or the total quantity of food, considered as body fuel.

The following table gives the number of calories per man per day for the various occupation groups listed. These figures are for the most part the averages of the diets of many individuals, and fairly represent the conventional eating habit of Americans.

QUANTITIES OF FOOD EATEN BY VARIOUS OCCUPATIONAL GROUPS

	Calories per day
Football teams	6,590
Lumbermen	5,420
Well Paid Laborers	3,925
College Clubs	3,580
Professional Men	3,480
Farmers	3,415
Southern Negroes	3,395
Skilled Mechanics	3,355
Teachers	3,195
Garment Workers	3,145
Office Clerks	3,125
Salesmen	2,980
Poorly Paid Laborers	2,810

It is seen that the amounts of food eaten by these different groups of people vary widely. The chief causes of these variations is the amount of muscular labor performed and the amount of money available to pay for the food. If individual data be given for different men, or different families, even in the same occupational groups, the figures would also show a wide range in quantities of food eaten.

A very interesting check on these figures on the amount of foods commonly eaten by Americans was made by the Hoover Food Administration during the war. Statistics were secured of the entire quantity of food consumed in the United States. Figured out according to popu-

lation and reduced to a unit of man per day, it was found that the average American man consumes 3,424 calories per day. This backs up very convincingly the figures secured by measuring the foods actually eaten by various groups of individuals.

From the studies of the amount of food that men *do* eat, food scientists tried to derive definite standards which should serve as a guide to tell men how much they *should* eat.

Such a table of food standards was drawn up by Atwater and was widely published by the United States Government. It was as follows:

ATWATER TABLE OF FOOD STANDARDS

	Calories
Men at very hard work	5,500
Men at hard work	4,130
Men at moderate work	3,500
Men at light work	3,150
Men at sedentary occupation or women at moderate work	2,700
Men taking no muscular exercise or women at light work	2,450

This seems to us now to be a rather foolish method of reasoning. To assume that what men *do do* is what they *should do* is certainly not the way to learn the truth or to make progress in the world. By a similar method of reasoning we might determine the average amount of stealing

that men do and thereby derive a standard of thieving. It also reminds one a little of the old lady's assurance that every one of us must eat his peck of dirt.

These illustrations are a little far-fetched, but even in more closely related instances we can see the fallacy of using the average man as a standard or guide for those seeking the best way to live. The average amount of exercise taken, at least by the city dweller, would hardly be accepted by the ardent physical culturist as a guide for his own practice. In the matter of the body weight this same error of accepting the average as the standard has actually prevailed—as will be fully brought out in our chapters which discuss the control of the body weight.

These dietary standards derived from observation upon average eating habits were further checked, and to a large extent verified by a more elaborate and scientific method. I refer to the use of the Respiratory Calorimeter. This interesting scientific device consists of an air-tight chamber properly insulated against loss of heat. If a man, or an animal, be placed in such a chamber it is possible to measure very accurately the amount of oxygen consumed and carbon dioxide given off, and so determine the amount of oxidation that occurred. By further measure-

ments may be determined the amount of heat generated and the mechanical labor of the test subject. By the usual chemical methods, both the food and the excretory products may be analized. When such researches are continued for sufficient time it is also possible to calculate from this data, checked by the changes in the body weight, the accumulation or loss of fat or protein substance from the body.

By such elaborate and thorough investigation scientists were able to learn just how much food the body seems to require and how that food was consumed or expended in the production of heat, muscular work, or in additions to the body substance.

The scientists reasoned that when a man's body was not increasing in weight and he was, therefore, utilizing all food eaten in the physiological and muscular activities, he required the exact amount of food so consumed. Experiments in giving him less food resulted in a loss of body weight which seemed most positive evidence that the amount of food could not be safely decreased.

This was the general state of scientific knowledge on the subject, "how much to eat," at the beginning of the war; moreover, this knowledge essentially verified the earlier food standards

that had been determined by investigating how much people *do* eat.

However, many health authorities and students of food problems who derived their opinions from practical observation of the effects of food on health and strength questioned these food standards which had been determined by elaborate scientific research. Among physical culturists and health reformers generally the opinion prevailed that over-eating was not an exceptional, but a general fault. Such men as Horace Fletcher and his associates had shown that better health could be maintained upon smaller food allowances. When Mr. Fletcher was sixty-three years of age he was tested in the Calorimeter and was shown to oxidize or metabolize nine calories per pound of body weight. This was the lowest ratio of metabolism observed among eighty-nine men tested. Yet Mr. Fletcher at this time was by no means poorly nourished, for he weighed 180 pounds, and was not a tall man. His years of careful eating had made it possible for him actually to get fat on less food that other men seemed to find necessary for existence.

Mr. Fletcher believed the chief benefit which he derived from his careful eating habits was due to thorough mastication. Dr. Chittenden, who experimented with Mr. Fletcher's methods upon

a group of soldiers and athletes, was of the opinion that the benefits were due to the use of smaller quantities of protein. None of these investigators laid chief stress upon the matter of total food quantity, though in all such cases there was a tendency to reduce it.

With the coming of the war, all manner of research in food science was greatly stimulated. Food economy became imperative for the whole world, and in many countries there was not enough food available to maintain anywhere near the former eating habits of the people.

Great suffering, and loss of health and of life resulted because of the food shortage during the war and the years immediately following; but if the teachings of the orthodox food science regarding the amount of food necessary had been true, the world's death list from food scarcity would have been enormously greater.

The European nations found out that men could live on much less food than they customarily do eat when their eating habits are determined by appetite, and there is ample food and sufficient money available to pay for it.

It is not a convincing argument to claim that the Germans or other peoples were benefited by the food restrictions imposed by war necessity, yet many careful observers of war conditions

were convinced that, as far as food quantity alone was concerned, the restricted diet was actually beneficial. The chief suffering came from the restriction of food variety and the depreciation of food quality. Not only were the poorer classes unable to get enough food, but all classes suffered from lack of proper food; especially from shortage of milk, butter and eggs, fats and fresh fruits and vegetables. The diet in many instances was reduced virtually to potatoes and cereals, an inadequate diet even if quantities were unlimited. Moreover, there was such a vast deal of suffering and privation from other than dietary causes that observations of the health, efficiency, or death rate of the peoples under war conditions are practically worthless as far as deciding dietary questions is concerned.

In America, however, scientific researches were conducted to determine the effect of reduced quantities of food, and from these researches we have gained much new knowledge. The investigations that I particularly refer to were conducted by Dr. Benedict of the Carnegie Institution.

Dr. Benedict experimented upon the students of the Y. M. C. A. College at Springfield, Mass. Many of the subjects of these experiments were taking the training course as Y. M. C. A. physi-

cal directors and all of them were taking gymnasium work, while many were active in outdoor athletics.

The diet provided in the College dining hall supplied 4,000 calories per day. This is a rather heavy diet, but the students were very vigorously exercised young men. Not all of these men may have been in the habit of eating 4,000 calories a day, but from actual records it was evident that all of them were consuming well above 3,000 calories per day.

The method of the restricted diet experiment was to cut down the food allowance of each man individually until he had lost ten per cent of his weight. After such a loss of ten per cent of each man's weight, his food was carefully adjusted to a quantity that would just maintain the body weight at ninety per cent of the original figure. The amount of food that each man required to maintain this restricted weight was then determined. The amounts varied according to the size of the men and their habits of activity, and ranged from 1,600 to 2,500 calories per day. The average figure for the group was 1,950 calories per day. This was less than half the food that had been previously provided for these men, and certainly not over two-thirds the amount that any such group of men would have

consumed if following the usual American eating habits.

According to the old pre-war teachings of science it would have been thought that men could not have maintained their health and physical efficiency upon such small quantities of food. But these men did maintain normal health, and elaborate studies of both their mental and physical efficiency showed that they suffered little, if at all, due to living on the much reduced quantity of food. This is the more remarkable when we realize that these men did lose ten per cent of their weight and that this loss of weight occurred in men who entered the experiment as active trained athletes and were not carrying a lot of excess fat. Their muscles may have been actually reduced in volume, though probably the chief loss in weight was due to a loss of a small portion of fat that even the athletic man carries, if he be a heavy eater. The nude photographs of these men after their weight reduction still showed them to be fairly well muscled and seemingly in fit physical condition. Their athletic records and physical tests on reduced diet showed that they had lost neither strength nor endurance.

What really seems to have happened is that the muscular tissues that they retained became more efficient. Tests in the respiratory calori-

meter showed that they were able to perform a given amount of physical labor with a smaller consumption of oxygen, which means that less food substance was oxidized or consumed. The physical engine actually became more efficient, and turned out more labor per pound of "human coal."

This extremely restricted diet was not, however, without certain effects which many people would consider undesirable. For instance, the rate of the heart beat was distinctly lowered; the circulation being slower, the skin temperature was slightly reduced, and the men complained of being chilly and were obliged to dress more warmly. The blood pressure was also lowered, a thing which most physicians consider an indication of health improvement.

On the whole, we may summarize the findings of these extremely interesting experiments by saying that the body has the power to adjust itself to various food quantities or nutritive levels. While the usual result of excessive eating is obesity, yet it is apparent that one may eat more than he needs and yet not get fat; he merely disposes of the extra food by using it wastefully. From such overeating the rate of the heart beat and respiration are increased so that more food fuel is oxidized with the production of an

excess of body heat—a very convincing argument in favor of a light diet during hot weather. With the larger quantities of food the body simply runs at higher pressure; all physiological activities are speeded up or more extravagantly conducted.

Just how much benefit or harm may come either from this higher pressure living or the physiologically more efficient low pressure living is not so easily determined. Of this, however, we have convincing proof: minimum eating is not immediately harmful, nor is there any danger or loss of efficiency from a reduction of weight somewhat below the amount usually carried, even of the athletic type.

An experiment of a few months' duration proves but little as to the long run effects that might occur from the same conditions maintained for a life-time. Upon this subject we will take up some interesting facts in our chapter: "The Diet in Old Age."

From all scientific data now available, as well as from practical observation, I would say that the most nearly ideal dietary standards of food quantities would be midway between the old Atwater standards and the minimum figures attained in Dr. Benedict's experiments. This should give us a figure of about 2,500 calories per

day for a man of average size at moderate work, which is 1,000 calories less than Atwater's standard.

The dietary figures for women have usually been given as eighty per cent of those of men. I believe that for the average woman, who takes very little exercise and is inclined to be fat, even this proportion is too high. For the woman who is physically vigorous and active, as she should be, the proportion is about correct, which would give us a standard of 2,000 calories per day for the average woman at moderate work, in the place of 2,700 calories, as given in the Atwater standard.

I give these figures only to show clearly the changed views on the question of how much to eat. In actual practice no dietary standard of so many calories per day is of practical use to the individual. In the first place the figuring up of the calories of one's diet is an unreasonable task to impose upon any one but a scientist. In the second place, such general standards are worthless when applied to an individual case, because individual needs vary so widely. The chief cause of this variation is the actual size of the active body or the weight of muscular tissue, and this fact is difficult to determine. The bigger a man is, that is, the more muscle he has, the

more food he will need, but the heavier, that is, the more fat he has, the less food he should eat. Lastly, there is no way to tell just what is meant by light, heavy, or moderate work. A man may feel that he is working very hard, merely because of monotonous labor, unpleasant surroundings, or mental strain. Another man working pleasantly with a variety of muscular movements may seem to be working less hard, though he would require more food fuel for his activities.

There is only one practical method by which to gauge the amount of food one should eat; and that is by observing the weight of the body and one's general feeling as to strength and health. The ideal food quantity is that amount which will just maintain a feeling of super bodily strength and endurance and ideal weight. Here again, of course, we are dealing with a standard upon which peoples' opinion may differ. Almost any one has a fairly definite conception of the ideal form of the human body. With proper muscular development this ideal form will, for each individual, be a sufficient guide to the ideal weight. The practical trouble is that very few individuals, under the conditions of modern civilization, have sufficient muscular development.

If a lazy, unexercised man, five feet eight inches in height takes as his model a perfectly

developed athlete of the same height who weighs one hundred and sixty pounds, and the lazy man attempts to attain the athletic weight by eating rather than by exercise, the result will be a fat and over-fed man. On the other hand, should an exceptionally well muscled man reduce his food until it resulted in his coming down in weight to reach the average figure, it would merely mean that he would lose the exceptionally fine physique that he had built up. In practice there is much less danger of the latter error than of the former one.

The ideal plan is, therefore, to eat just enough to maintain a feeling of strength and all around vigor and with the body in a well-muscled condition and without any visible evidence of surplus fat. Even a very slight increase of the body weight above this muscular minimum indicates over-eating. The condition of the body is usually most easily determined by the presence or absence of fat on the abdomen. The man in first-class physical condition has no more fat upon his "stomach" than he has on his arm, and the form of the abdominal muscles may be felt beneath the skin as readily as the biceps. Few men maintain such fitness, but that is no proof that it can not and should not be maintained. Most men do over-eat and under-exercise; and most men

are too fat, and die from ten to twenty years before their time because of it.

The above discussion has been written primarily from a masculine standpoint. The feminine form naturally carries less muscle and more fatty tissue than the masculine. There are fundamental physiological reasons why this should be so. Nature adapted the feminine body to a more ready storage of surplus nutrition as a preparation for child-bearing. Our ideas of feminine beauty also require the presence of more fat in the feminine than in the masculine form. This ideal of fatness in feminine form was formerly carried to an extreme, which the present generation is trying to get away from. The modern woman wishes to be "slender," yet even her ideal of slenderness usually means a comparatively fat condition, because of the lack of muscular development. The true ideal of feminine form is only maintained by the athletic type of woman, and a form maintained by over-eating instead of by proper exercise is not a true or lasting form of beauty.

Those who are obviously under-weight or over-weight will find their problem most thoroughly discussed in later chapters. For the individual who is of approximate normal weight I suggest an experimental cutting down of the amount of

food eaten until it results in a loss of from five to ten pounds of weight. Such an experiment will do you no harm and you may find that it will produce a marked benefit in health and efficiency as well as in food economy. In such cutting down of food quantities, as in reducing from obesity, it should be the starches and fats that are eliminated. Indeed, if you have been living upon the conventional diet, almost invariably too rich in the fat-forming foods, you are likely to find that the adoption of the type of diet advocated in this book will result in some loss of weight without any conscious effort on your part to reduce the food quantity. If so, be reassured that this loss of weight will prove beneficial.

CHAPTER VIII

When and How to Eat

AS a practical means of controlling the quantity of food, the number of meals per day is very important.

The conventional custom of three meals a day is purely an arbitrary one. Natural man probably ate when he found food, if for no other reason than to keep the other fellows from getting more than their share. As civilization developed and man acquired definite occupations, he adopted the habit of regular meals.

The number of meals per day is probably of less importance than the amount of food eaten. A man can over-eat on two meals, but he is far less likely to do so than on the three-meal plan. This fact was absolutely demonstrated by an investigation conducted by the PHYSICAL CULTURE MAGAZINE. A number of individuals and families agreed to experiment upon the three-meal versus the two-meal plan. Nothing was suggested to these voluntary experimenters as to the total quantity of food they should eat, but all were asked to keep a record on their total

food purchases for comparison under the two competing plans.

In this investigation it was learned that the adoption of the two-meal a day habit almost invariably resulted in a considerable cutting down in the total quantity of food eaten. The amount eaten per meal, however, averaged a little more, the reduction of total food on the two-meal plan being about twenty per cent, whereas had the individual meals remained of the same size it would have been a thirty-three per cent reduction. This twenty per cent reduction of food quantity achieved by the two-meal plan resulted in a general improvement of health and vigor. There were a number of cases of a loss in weight on the part of individuals who had been over-weight. It is probable that the others also lost some weight, but in too small amounts to be noted and reported.

The only experimenters who were not enthusiastic about the two-meal plan were those who were occupied at heavy manual labor. Although there may be exceptions in either case, I believe it is a very safe principle to advocate three meals a day for manual laborers and for growing children. For adult brain-workers the two-meal plan is almost invariably an advantage. To say nothing of the physiological benefits, the

two-meal habit is worth while as an economy of food and time—most of all as an economy of labor for the housewife.

Where the family contains manual workers or children, three meals should, of course, be served; adult brain-workers in such families could either skip one meal, or if they feel this to be an outrage of the conventional family life, they may compromise by eating lightly at the first two meals of the day.

The general habit of city dwellers of having the heavy meal or "dinner" in the evening seems to be correct. Not only is the food digested better when one is resting, but both muscular and mental work is better performed when one is not digesting. The American farmer calls his mid-day meal "dinner," and presumably it is the heavy meal of the day. A man who gets up with the sun can certainly work up an appetite by twelve o'clock. None the less, over-eating at the noon meal, followed by immediate return to heavy labor, is not the best plan. The farmer puts in the longest hours of work of any type of worker, and it is unreasonable to expect him to subsist on a grape fruit and light cereal breakfast and a salad luncheon. Such a plan would merely mean that he would have to gorge himself at night. For the farm family I would, therefore,

advocate moderate breakfasts and noon meals and a slightly heavier evening meal.

The city manual laborer should follow the same general plan with a somewhat greater proportion of his food for the evening meal, for the reason that he has leisure then to digest his food, whereas the farmer's hours are often completely filled with work until bedtime.

The brain-worker may omit either breakfast or luncheon altogether, or he may gain the same effect by taking a very light breakfast and a very light luncheon, and in either case not "eating his fill" until after his work for the day is over.

Where digestion is slow and imperfect a hearty evening meal is sometimes unsatisfactory. Especially if you can not sleep or if you wake up during the night or in the morning with a sour or bad taste in your mouth. Under such circumstances it is better to eat your hearty meal at noon or in the morning, though if a hearty breakfast is eaten, it is usually better to go to bed hungry if your digestion is not over strong.

Here is a simple meal plan that I have recently been following myself and which I have found eminently satisfactory.

I take only one full meal a day. I have no exacting rules or regulations as to the quantity of this meal. It is what is commonly called a

"square meal." In other words I eat all I want to, and do not concern myself about restricting the quantity.

The other two meals are very simple indeed. One is composed of one or two oranges; the other of nuts and raisins, which must be well masticated and eaten slowly, and with which there is little danger of over-eating. When these two simple meals are so restricted there is little danger of over-eating for the day, no matter what the nature of the foods eaten in the full meal.

Whatever the meal plan followed, the idea that absolute regularity is the most important of all eating virtues is an illusion and often a very harmful one. It is far better to eat irregularly than to eat regularly without appetite. When one is particularly over-wrought or over-worked, eating frequently does more harm than good. Strength from food does not come immediately after it is eaten; on the other hand, the process of digestion temporarily subtracts from the vital energy what would otherwise be available for work.

Just as monotonous foods will cloy the appetite so monotonous regularity of meals will do so. It is far better to skip the meal entirely than to eat it if it is not fully enjoyed. Proper appetite or enjoyment of food is essential to prop-

er digestion. Hasty eating is injurious, both because one does not enjoy food so eaten and because of the lack of mastication.

When it does not exist naturally, stimulating the appetite by highly seasoned food is an abomination—and an abomination all too frequently practised upon those "enjoying ill health." The subject of fasting as a curative agency I will not take up in this book more than to say that fasting is nature's remedy against over-eating and the consequent accumulation of surplus food and waste elements in the body—and that fasting is the one sure cure for loss of appetite.

The adaptation of the diet to the climate and the season of the year is of considerable importance in maintaining efficiency, health and comfort. Over-eating is at all times a fault, but it is particularly so in a warm climate, or in the summer-time.

As pointed out in the last chapter, over-eating increases the temperature of the body. In fact the very act of digesting food creates a measureable amount of heat; from ten to fifteen per cent of energy of food being utilized in its digestion. In the case of meat protein there is a stimulating effect considerably greater than this figure. Tests made upon a fasting dog showed that the number of calories oxidized by the dog's body de-

pended on the temperature of the room and ranged from about eighty-five calories per hour at a temperature of forty-five degrees, down to fifty-five calories per hour at a temperature of eighty-five degrees. But the dog, after a heavy meal of meat generated as many calories per hour, while digesting it in a hot room, as he did in a cold room—and had to keep cool, dog fashion—by panting. In the case of a man the increase of heat formation in the body from eating a pound of meat is about twenty-five per cent.

In addition to the development of heat in the process of digestion there is a further heat development caused by the excessive oxidation of food element in the overfed body. A man living under a restricted or minimum diet can run a foot race or perform other vigorous exercise without getting so "heated up." This is indeed the proper explanation of the greater endurance of light eaters.

Comfort in hot weather, therefore, depends upon the cutting of the diet down to the very minimum needs. The natural diet of the summer should contain a large proportion of fruits and succulent vegetables, whereas fats, meats, sugars and starches should be greatly reduced. In winter these foods may be restored to the diet in somewhat larger amounts, but this should

not be to the exclusion of the leafy vegetables and foods of the milk group which are needed at all times to supply essential vitamines and minerals.

Once a meal has been selected, prepared and set before us, the two most important factors in healthful eating are the enjoyment of the meal and the mastication of the food. These two matters are closely allied, since food is never really enjoyed if it is bolted down without proper mastication.

I have already explained the effect of the appetite and the enjoyment of food upon the secretion of the digestive juices; likewise we learn from similar studies that fear, worry and undue excitement, or extreme fatigue seriously interfere with the process of digestion. Not only do these unhappy emotions check the flow of the digestive juices, but they may stop the muscular movement of the digestive organs. This effect has been remarkably demonstrated with the X-rays. An insoluble substance that is impervious to the X-rays is mixed with the food of a small animal like a cat, whose body is then observed in an X-ray chamber. After such an experimental cat has become used to the chamber, the process of digestion is resumed and the pulsing peristaltic movement of the alimentary

tract may be plainly seen. Now, if the cat be frightened by some unearthly noise, immediately all movement of the stomach and the intestinal muscles come to a dead stop.

But to command a person to enjoy his food will not cause him to do so. Enjoyment of food is a problem one must work out for himself as far as the condition of the mind is concerned. The more strictly dietetic factors in this matter of appetite or food enjoyment are: First, true appetite or hunger, which can only be regained when it has been lost, by either decreasing the amount of food, or increasing the amount of bodily exercise until there is a true physiological need of food. Second, the foods must be so prepared and served that they will be attractive. This question of the attractiveness of food is largely a matter of habit. Those who have been addicted to over-eating and the use of highly seasoned dishes can only regain the appetite for simple foods by going without all food until genuine hunger is re-established. Any artificial appetite which enables one to enjoy a food beyond the body's true needs is an acquired or harmful appetite, like the appetite for alcohol or tobacco.

The simplification of the diet by reducing the number of foods eaten at one meal, and by the

serving of such food in the elementary form with a very simple combination of dishes will do much to revive true food instincts, so that the appetite will again become a natural guide as to both the quality and the quantity of food required.

Thorough mastication is also of great help in the establishing of a true, instinctive appetite. Natural foods have their own flavors, but these flavors are only fully brought out by a thorough mastication and the full tasting of the food.

There is no food which should be swallowed without mastication, or, in the case of liquid foods, the natural insalivation which is accomplished by moving them about in the mouth until they are thoroughly mixed with the saliva and swallowed by instinctive motion rather than by voluntary gulping. This effect may be very readily noted in the case of milk. Milk may be drunk outright, as is water, but such drinking of milk or other liquid food is not correct; it should be sipped slowly and swallowed instinctively.

The more nearly you can approximate the suckling baby in taking your milk the better it will digest. The proper way to "eat" milk is to place the lips to a glass of milk, and make the opening between them so small that you have to make quite an effort to "suck in" the milk.

This pressure forces more saliva into the mouth and gives the milk a flavor that can not be secured when one merely drinks it.

It is quite possible to acquire the habit of masticating foods that have already been milled and cooked until their mastication is a sort of empty performance like boxing with a ghost. This, indeed, was the distinctive feature of Horace Fletcher's eating habits. However, it seems to me that the more sensible procedure is to adopt foods in their more natural forms so that the act of mastication has some resistance to work against. The average foods in man's natural diet were neither as hard and gritty as dry whole grain, nor were they as soft and substanceless as cornstarch pudding. Nut meats and tender leaves and vegetables are about the degrees of firmness to which man's teeth and chewing powers seem to be adapted. Grains to be reduced to like degree of masticability require some softening. Rolled whole grains or firm whole wheat bread are in a form that seems well adapted to man's chewing powers. The same is true of the general run of vegetables. When foods are softened beyond these stages it will require a conscious effort to chew them more than their mechanical condition really requires, if the process of mastication is not to fall below the

amount needed to bring out the proper flow of digestive juices and a sufficient slowness of eating.

Of all food substances the danger of lack of mastication is greatest in the case of starchy foods and nut-meats, the former requiring a thorough admixture of saliva for their digestion; for this reason all forms of starchy gruels or porridges are less desirable than firm breads or granular cereals. In the case of nuts, thorough chewing is necessary because the nut meats will not digest well unless they are finely divided. Pulpy fruit juices in which sugar is the main ingredient require the least mastication of any food. Natural sugars are already in a form to be absorbed by the blood and hence require practically no digestion. But even in this case there is no evidence that mastication is of any harm and the better rule is to masticate all food thoroughly.

Mastication is also a very good remedy against over-eating. The act of mastication and the thorough tasting of food result in the full secretion not only of saliva, but, by the sympathetic nerve coordination of the glands, the secretions of the stomach are also influenced. Under these proper conditions the appetite is normally satisfied and the instinctive warning to cease eating is given us when we have eaten enough food to

meet the body's true requirements. But when foods are hopelessly mixed up in cookery, overseasoned and ground and mushed until no chewing is required, and then bolted down, the effect of the whole process is to confuse and destroy all instinctive appetite. As a result, the person eating in this fashion does not know when to quit and often does not quit eating until warned to do so by the painful stretching of the walls of the stomach, or perhaps by the limitations of the girth of his belt.

CHAPTER IX

Food Production; Manufacturing and Marketing

IN a book devoted to practical advice on eating, we can not attempt to give any encyclopedic information regarding the production, manufacture, and marketing of food. Such facts as I note in this chapter are, therefore, given because they throw light on the more immediate personal food problem, or suggest industrial changes that any one interested in food reform would do well to comprehend and advocate.

As pointed out briefly in Chapter V, the present diet of mankind is not the result of following either the dictates of natural food instincts, or of any recent and scientific plan for the proper nourishment of the human race. Man made his conquest of the world and became the dominant species because of his ability to adapt himself to changes in diet and his ingenuity in increasing his food supply. As we see the world in its present state, both the kind of food and the amount of food produced are subject to the economic laws of supply and demand.

In other words, food is at present produced for profit, and the farmer or food manufacturer gives us such food as he finds we will pay the most for in proportion to its cost of production. If the foods so provided for us are not the best that might be provided, it is because we will not demand and pay for better ones.

The chief criticism that the food reformer, interested in the health and efficiency of the race, has of the present system of food production is that it gives us an over-supply of foods derived from grains and from the flesh of cattle and swine. This overproduction of grains and meat, which is the fault of the entire modern scheme of world food production, is exaggerated in the United States. This is due to the fact that this country is still comparatively sparsely populated. We wrested from the few roving Indians their vast hunting ground and found it to be the richest of the world's productive lands. The easiest way to mine this store of fertility, accumulated through vast geological ages, was to crop the land with the grains or graze it with cattle. So we have cereals and meat in abundance, and in the matter of food quantity the United States is the best fed nation on earth. But our system of food production is not the best suited for developing human efficiency, nor is it the most

economical and efficient way to support mankind from the soil.

Grains yield a comparatively large amount of starchy fuel food with comparatively little labor, but the cropping of the ground with fruits, nuts and vegetables will yield more total food and far more varied and wholesome food. One has but to observe the corn plant in comparison with lettuce or cabbage to appreciate the waste of grain production. The stalk of corn, with its abundant foliage, is a rank and luxuriant growing plant from which we merely shuck the seed ear—the corn's provisional store for the next generation of the plant—and discard as human food the bulky remainder from the plant.

Though the leafy corn fodder finds some use in feeding animals, the stalk is not even used for that purpose. Worse yet, the great bulk of the grain crop of corn is not used as human food, but is also fed to animals. Agricultural authorities, in America at least, assume this to be a proper form of husbandry. It is a profitable form merely because it is less laborious than more intensive agriculture required for the direct production of the human food from the soil—and also because we, as a comparatively wealthy nation, can afford to eat the meat and pay for it. We also thought until recently we could afford

a similar waste of food substance in the production of alcohol. The inference that meat is as harmful as alcohol is an exaggeration; but meat is certainly physiologically of less worth than the better varieties of vegetables; and, economically, the production of meat involves a total waste of human food producing capacity of the soil many times greater than the former waste in the production of alcohol.

As calculated by the United States Food Administration, the total amount of human food consumed per year in the United States is 130 millions of millions of calories. But the total amount of food substances consumed by farm animals is 686 millions of millions of calories, or five times as much! If we had no animals we could support five times as many people! Allowing for the food eaten by horses, dairy cows and laying hens, we can safely say that meat production alone halves our available human food supply.

The ratio of waste of nutritive substance in the feeding of plant foods to animals varies with the kind of meat or other animal products produced. It takes about ten or twelve plant food units to produce one food unit in the form of beef. The ratio of waste in the production of mutton is nearly as great, though it has in its favor not

only the great human utility of the production of wool, but also sheep (and goats) which are the most capable of all animals of existing in arid or barren regions. Swine are much more efficient in retaining the energy value of food, requiring only about four or five plant food units to produce one food unit in animal form, but most of this extra energy is in the form of lard. In both beef and pork production the waste is inexcusable, not only because of the loss of the food substance, but because there is no nutritional superiority in the quality of the products so wastefully produced.

The dairy industry stands in an entirely different class. The dairy cow is the most efficient of all animals in this matter of food conversion, requiring only about four units of plant food substance to produce one food unit of milk. Still more to the credit of the cow is the fact that her product has a decidedly higher nutritional worth than the plant foods from which the milk is produced. While the human race can exist without the use of milk and its products, there is no known diet as efficient as the lacto-vegetarian for the nutrition of the race and particularly for the nutrition of children.

The production of eggs by hens specially bred for that purpose, while not as efficient as the

production of milk, is more efficient than the production of beef; and like milk, eggs are a food of superior nutritional value.

In the case of both dairying and egg production there is a meat by-product that man, with his meat loving appetite, will never have the extravagance to waste. Uninformed city people may be under the impression that beef production and dairying are merely two halves of one industry; this is not the case; the majority of our beef comes from the beef breeds of cattle which produce but little milk other than that used for the calves. In well specialized dairy farming the only meat produced is from the young male calves and the cows that have served many efficient years as milk producers. Such a meat production, even with an increased milk production, will be far less than our present output, and the total nutritional waste involved will be much less. The hog could be eliminated from our civilization with no loss to mankind. The chief use of this animal has been the production of fat, and in America we have an abundant source of food fat in economical cotton-seed oil. Moreover, the growth of the world's nut crops and other oil producing plants, as well as the desirable increase in the production of butter fat, would permit of the elimination of lard from our diet.

We would not be much better off in matters of food quality if we merely attempted to utilize as human food the grains now wasted in meat production. This change would indeed increase the total quantity of food and enable America, now producing scarcely enough to feed her own population, again to contribute abundantly to the feeding of other and less fortunately situated people.

But it is not the mere utilization of these foods now wasted on animals that is needed, but rather the use of our fertile land to produce a better quality of human food directly from the soil. The most efficient method of converting the soil fertility and the sun's energy into human food, is in the production of quick-growing, tender vegetables, all, or nearly all, of the substance of which may be consumed by man. In the case of fruit and nut crops, it is true that we consume but a small portion of the plant; but that seeming inefficiency is largely overcome by the fact that the fruit or nut tree stands for many years; hence the bulk of the plant is not wasted each season, but, like the body of the dairy cow, it is maintained year after year as a comparatively efficient instrument for producing a high quality food crop. Moreover, the roots of trees go deeper into the soil and utilize fertility that

can not be reached by shallow growing annual plants.

It is to our vegetable gardens, to our orchards, our dairy herds and our laying flocks of hens that we must look for our most physiologically efficient and economically efficient sources of food. But these industries do require a higher order of intelligent husbandry, a relatively greater amount of skilled labor, and a greater degree of foresight for the future than do the cruder and more wasteful forms of skimming the cream of nature's stored fertility by the grazing of animals and the cropping of grains. The man who engages in, or encourages any of these more efficient food producing industries, is a benefactor to the human race as certainly as the man who founds a library, or makes a labor-saving invention.

The question of the marketing of foods is one that more immediately concerns the consumer than do these fundamental problems of food production. The concentration of such a large portion of our population in the cities results in a great economic waste in the evil necessity of feeding such population upon foods produced on comparatively distant soil. Unfortunately this cause of waste is the greatest in the case of the best quality of foods; milk, eggs and fresh

fruits and vegetables are both bulky and perishable; hence the process of getting them from the farms to the cities is expensive, and, what is worse, too often results in a loss of freshness and deterioration of quality.

It is a painful fact for the city consumer that the price he must pay for fresh milk or vegetables is more than double—sometimes quadruple—the price that the producer receives for them. The middleman is usually blamed for this seeming outrage. As a matter of fact, the middleman, that is, the jobber or wholesaler, deals in food products in large units and his profits per quart or pound are not much of a tax on the price the consumer pays. It is rather the cost of gathering these food products from their scattered sources, and, even more, the expensive process of their retail distribution and delivery in the city that piles up the cost. The entire scheme of food marketing is complex and confused, and no remedy has as yet been found that will entirely overcome the obvious wastes. Co-operated marketing by the producers is making rapid strides and doing something to solve the problem, but the chief financial benefits probably go to the producer rather than to the consumer. Moreover, it is at the consumer's end that the costs pile up most rapidly. What may be done to relieve

the situation, in the way of co-operated buying by the consumers, public marketing enterprises, or direct marketing by parcels post from the producer to the consumer, remains to be seen. As an individual problem there is only one sweeping remedy for this high cost of food marketing and that is to get out of the city and get back to the land, or at least to the small community in direct connection with the land. Those who are in a position to make this change without the loss of earning powers can certainly solve the cost of living problem. Moreover, if they will use intelligence, they can improve the quality of the diet.

While the country is the place where the best food may be had, it is unfortunately not always true that farmers are the best nourished. Ignorance and shiftlessness is the explanation. Many farm families are content to eat a few fresh vegetables or fruits in season and to live the rest of the year on pork, white flour and potatoes. The fact that the food they grow is relatively cheap makes them disinclined to buy vegetables, fruits, nuts from distant markets; or, if they do buy them, they get only the poor quality of commercially canned or dried products.

A family living in the country should by all means use an abundance of eggs and milk which

may be had by their own labors or be purchased from the neighbors at half the price the city consumers pay. Vegetable and fruit gardens should likewise be developed to their fullest possibilities, and the crops planted for a steady supply from the first growth of "greens" in the spring to the late fall crops of winter-keeping fruits and vegetables. For the months when fresh garden and orchard products are not available the farmer should preserve an abundance of canned or dried fruit or vegetables. Though such practice is not widely known, the exceedingly important leafy vegetables or greens may be dried or desiccated and so preserved for winter use. In warm and dry countries this may be accomplished by sun-drying, while in damp or cooler regions a simple desiccator may be constructed by any handy man, and all manner of fruit and vegetables, including greens, may be admirably preserved by drying.

Another way in which the farmer, or dweller in farm regions may very readily improve the quality of the diet, and at the same time achieve great economy, is by the use of whole grains. Chief among these is wheat. No better cereal food has ever been invented than whole boiled wheat. When the cooking is started the day before, and the grain allowed to soak the whole night in warm water, or the wheat is left for sev-

eral hours in a fireless cooker, whole wheat becomes delicious. Ground coarsely in any rough mill, wheat makes a cereal food that may be more quickly cooked. The same grinding process, with the mill set firmer, produces the only genuine whole wheat or Graham flour.

Whole corn hominy is another excellent and exceedingly cheap food, available to anyone who can procure clean, high quality corn. Corn must be boiled a long time to become palatable. Because the outer thin bran of corn is quite tough and also because of the presence of a wood tip where it joins the cob, the pioneers developed the process of making lye hominy. It is made by cooking the corn in lye water for several hours. Then the thin outer skin and the hard woody tip may be easily rubbed off. The rich, oily germ is retained. The corn must be soaked for many hours, preferably in running water until all trace of the lye has been removed. The chemically inclined reader can make this product by boiling the corn in caustic soda and washing out most of the alkali and neutralizing the remainder with hydrochloric acid, until it is neutral to litmus paper. The only chemical then left in the corn is a little common salt.

In commercial corn milling not only the outer bran and tip are removed, but the large germ,

rich in oil, vitamines, and minerals, is also discarded. Freshly ground whole grain corn meal is decidedly superior to this commercial product. The fresher the corn the better. One of the most tasty of cereal foods is grated corn meal made from ear corn picked just before the grain hardens. The new crop corn even when hard enough to grind is of nearly equal flavor. Only those who have tasted corn meal mush or corn bread made of such meal can realize the relative inferiority of the commercial corn meal made of old dried corn and from which the germ has been entirely removed.

These superior whole grain food products are not so available to the city man. Whole or cracked wheat can sometimes be purchased in town, and genuine whole wheat flour and also so-called water-ground or whole grain corn-meal are in the market if one has the persistency to search them out and refuse the inferior substances offered by the millers.

The question of the preservation of food is important both from the standpoint of economy and wholesomeness. It would be better if we could partake of all foods in the freshest possible condition. In such a state, foods are not only more palatable, but in the various processes of preservation some of the vital qualities may be

actually lost. Still worse, in some of the many manufactured foods harmful or poisonous chemicals may be added.

This latter evil, which was once very serious, has been abated of recent years by pure food legislation. Some of the milder preservatives are, however, still legally permissible, whereas the old-fashioned methods of preservation by salting, vinegar pickling, spicing and smoking never came under the ban of the law. Any such chemical method of food preservation degrades the quality of the food as well as adding to it, if the preservatives are not removed, an unnatural and harmful substance. We do not ordinarily think of salt and vinegar as "chemicals," but it is the writer's belief that used in excess these old-fashioned preservatives are quite as harmful as some of the strange, new chemicals, such as benzoate of soda, which frighten the housewife more because her grandmother did not use them.

Other than chemicals, there are three methods of preserving foods: The first of these is the application of heat, followed by sealing in air-tight containers; the second is the continuous application of cold, or what is familiarly known as cold storage; lastly, there is the process of removing all water by drying or desiccating.

The preservation of foods by heating and can-

ning ordinarily does no more harm than the process of cooking; however, either process destroys some of the vitamines, hence a diet having no fresh or uncooked fruits and vegetables is inferior to one in which these foods are available only in the form of canned goods.

Cold storage is really one of the best methods of preserving food, if the foods are of such nature that they are not injured by freezing. Little if any decay can go on in *frozen* food. The prejudice against cold storage foods is partly an economic one, the consumer believing that the storage man buys the food cheaply in seasons of plenty and holds it until the season of scarcity and high prices. Of course, there is something to be said on the other side, as it costs money to run a cold storage warehouse, and the food speculator has to take his chances on occasional losses. The most important objection to storage food is that many of them are stored *without freezing,* and hence slowly decompose, sometimes developing ptomaine poisons in the process. Fortunately, the present laws demand that the cold storage food be sold as such, and the particular consumer may avoid them if he wishes.

The preservation of food by proper drying or desiccation is the least expensive and least objectionable method that can be used. As a mat-

ter of fact many of our foods, such as nuts and grains, are naturally desiccated. Dates, raisins and other evaporated fruits are a wholesome and palatable form of desiccated food. Practically all fruits and vegetables may be desiccated; even milk, with proper facilities, can be reduced to a dry powder which retains nearly all of the qualities of fresh milk.

No form of preservation ever improves food, but the canning and desiccating processes do little harm other than the occasional loss of the fresh flavor. By all means use fresh foods at all seasons when they can be had at reasonable prices, but it is wiser to use the better forms of preserved foods than to omit essential foods or food ingredients from the diet.

The manufacture of food has, under our present industrial system, been developed to a wholly unnecessary degree. For the most part foods do not need manufacturing, but commercial instinct here steps in and finds some way to make a profit by grinding, mixing, pre-digesting and processing food. If the resulting product is something new or strange of appearance, or artificially flavored, the clever manufacturer is able to foist it on the public as something superior, and sell it at a sufficiently advanced price to make a profit thereby. As a matter of fact few manu-

factured foods are in any way superior to the natural food ingredients out of which they are made; and in many instances are decidedly inferior. Complicated manufacture of foods permits of disguising the original nature of the ingredients and hence encourages the use of inferior material.

Perhaps the greatest of all evils of food manufacturing is the refining and denaturing of cereal products, an evil which I have already had occasion to mention several times in this book. The absurd part of the situation is that all such refining is expensive both because of the cost of the process and because of the discarding of part of the ingredients. The public has itself to blame for all this because it has demanded the uneconomical and inferior products. Today one is often charged more for whole wheat flour than for white flour, for the simple reason that there is not enough demand for the former to induce the miller to make it and the grocer to sell it at a reasonable price. The situation is still worse in the case of unground whole wheat which, though worth but two or three cents a pound, can either not be purchased at all in the cities, or if purchased, is sold for from two to ten times its value.

CHAPTER X

The Home Preparation of Food

ENTIRELY too much time and entirely too little intelligence are ordinarily expended on the home preparation of food, or to use the more ordinary word "cooking."

Cooking, as a matter of fact, is a wholly artificial process for which no argument can be found in nature. Cooking was originally adopted by man as a means of rendering grain and meat more palatable. Raw dry grains are too hard and too dry for any creature to eat unless provided with heavy molars, or a gizzard full of sharp rocks, for grinding purposes.

It is commonly taught in cook books that raw starch is indigestible. This is a fallacy. Farm animals fed experimentally on cooked grain do not digest it as well as the raw grain. This evidence may be rebutted by stating that man has been a cooking animal so long that his digestive system is no longer adapted to raw foods. This argument, however, is not correct, as has been proven by experimental tests. A man can digest practically all kinds of food raw, including

cereal starch. Cooking, therefore, is not to be defended on hygienic grounds, except in so far as the cooking of food may render it more palatable.

Meats might be cited as an exception to this, or for that matter so might any dirty or contaminated food, on the ground that cooking is needed as a sterilizing process. I certainly do not advocate the eating of raw meat, chiefly because the idea is repulsive to me, as it is to most civilized people. Moreover, animal parasites may find entrance to the body through the consumption of raw meat. Even the consumption of raw oysters may lead to typhoid fever, if the oysters are from sewage-polluted water.

Just as the heating of food is necessary to kill germs of decay when preserved by canning, so cooking is recommended to kill disease germs. The fear of disease germs is nine-tenths nonsense; even those who painstakingly sterilize much of their food eat freely of lettuce and similar raw vegetables that have been exposed to the germ-laden air of the city streets. The germ-hunting doctors may some time get so tied up what with laws and fears that everything we eat will come in sterilized capsules. Until that time arrives I propose to continue to eat my fruit and vegetables and dairy products without

sterilization, provided that I can get them in a reasonably fresh and cleanly state.

Every diet should contain at least some portion of uncooked foods. Although scientists have not fully settled the matter, the evidence at present indicates that the vitamines and perhaps some of the mineral salts and proteins are rendered less digestible, or their nutritive attributes destroyed by cooking. At least we know, as a practical proposition, that the addition to the diet of raw milk or milk and eggs and uncooked fruits and vegetables frequently results in marked benefits.

Grain products can be eaten raw, in fact, raw rolled wheat, rye and barley eaten with milk and raisins form excellent cereal dishes. Raw rolled oats is also edible, when one learns to like the flavor, and is certainly as digestible as the pasty, mushy mass usually made by cooking the same material. Perhaps the best forms in which to prepare grains—all things considered—is a form of cooking that leaves the grains whole so that they still require some mastication, as boiled wheat, whole corn hominy and rice cooked Chinese fashion.

Ground grains may be used as porridges, but in the case of the resulting "mush" there is always the temptation to bolt the food, whereas,

being a starchy food, there is, particularly, need of mastication. For that reason it is much better to use cereals in the whole grain forms or to make them into bread. The effort to get bread that is so soft and delicate and that "melts in the mouth" without chewing is a mistake. This lightness and softness of white flour bread is a fault almost as grave as its chemical deficiencies. Many people object to genuine whole wheat bread on the ground that it is too coarse and hard; they are too lazy to chew it; such people would also object to taking exercise. If they carried their objection to the labor of living to a logical end, they should be put on a feather bed and fed gruel with a hose. Doubtless on this system of living they would become nice and plump like a goose stuffed with noodles—the goose gets fat and also develops an enormous liver which is used for the making of *paté de foie gras.*

It is possible in many of the large cities and in a few of the small ones to buy an honest whole wheat bread. But in the majority of American cities and towns it is difficult to secure the genuine article. Almost anything is called Graham bread—any cheap mixture of poor white flour, bran and by-products. In many millions of homes, therefore, the only practical solution to

the problem of securing whole wheat bread is to "bake your own."

The trouble begins with the flour. Whole wheat flour should be the most uniformly good of all flours, since the process of its making is the simplest; but it is often the worst. The correct recipe for making whole wheat flour is "Grind the wheat." The commercial practice is to assemble in one sack various proportions of the low priced offal of the white flour milling process and sell it for more than the price of the white flour.

These wheat offal compounds will not make good bread, not because there is anything wrong with the food qualities of the various portions of the wheat rejected in the process of white flour milling, but because the proportions are wrong and the mechanical condition is wrong. The usual commercial mixture sold as whole wheat flour has too little of both the bran and of the interior of the wheat kernel and has too much of the middlings and shorts and wheat germs. Such a flour is sticky, without possessing sufficient true gluten, and makes a soggy loaf and sometimes a bitter loaf because of the rancidity of the oil of the wheat germ that has stood too long exposed to the air.

I have never yet seen a miller's formula for

making whole wheat flour out of fine flour offals that can equal the pure ground whole wheat. Part of this fault is mechanical; the fine flour milling process rubs the bran to thin, papery flakes and grinds the rest of the kernel to impalpable powder. On the contrary, the simple grinding of wheat in a mill not too finely set results in breaking up the kernel into particles of varying sizes. The interior portion easily reduces to a fine powder, but the outer part breaks up into flakes of bran to which adhere the inner bran coats and portions of the white meat of the kernel; such natural ground wheat with its particles of various sizes makes a loaf that is superior to that composed of papery bran flakes and other ingredients finely powdered.

The surest way to get good whole wheat flour is to get good whole wheat and grind it yourself or have it ground. A coffee mill will do it—laboriously; the little home mills now happily on sale for the purpose will do it faster; an ordinary stock food mill such as exists on many farms will do it splendidly, and an old water mill with its stone burrs will do it to the queen's taste. However obtained, the flour should be as fresh as possible, that freshly ground from wheat of the year's harvesting being the ideal—a thing equally true of corn meal.

Whole-wheat bread without leaven is possible, but it is heavy, damp and soggy. White flour bread without leaven is "impossible" unless it be the completely dried out cracker form. Made with soda and sour milk or with the various forms of quick chemical leavening, the whole wheat is superior to the fine flour. But these various forms of gems, cakes and muffins are not bread in the strict sense which limits the term to the yeast raised loaf that is palatable cold and improves with a few days' age.

True yeast breads are frequently judged by the degree of their lightness. It is an erroneous standard of judgment, for the really best bread, even when made of white flour, is not the most extremely light and airy loaf. But certain lightness bread must have, or it will be soggy, tough, hard and generally unpalatable. Whole-wheat bread can be made light enough for palatability though the process is difficult and the difficulty is increased by the breadmaker having learned her art on white flour breads, and attempting to apply its procedure to whole-wheat doughs.

Whole-wheat flour dough will not raise to the same degree as white-flour dough, hence, in trying to attain this end the thing is overdone, the dough falls, or, what is worse, bacteria get their work in and the dough sours.

The simplest method of all—I do not say the best—is the direct method. Take the usual ingredients, i.e., two cups of milk, scalded and cooled, a teaspoonful of salt, a fourth cup of sugar or molasses, and a cake of yeast dissolved in one-fourth cup of warm water, and mix with enough whole-wheat flour to form a dough as thick as can be stirred with a strong arm and a stiff wooden spoon. And keep on stirring for some time, as there is not going to be any kneading. Then pour into greased pans, filling them half full. Set them to rise in a temperature between 75 and 80 degrees. When the dough has risen to twice its bulk and so fills the pans, put them into an oven hot enough to bake them done in one hour.

This is the simplest method of making yeast bread that has been or can be devised. If you have failed with more complicated methods, try it.

Here is a more complex method: Take the same ingredients other than flour and set a "sponge." For this sponge whole-wheat flour may be used, but as the sponge forms only a portion of the finished loaf, white flour may be used for it and it has the advantage of being more glutinous and better holding the gas bubbles. This sponge is a thick batter but not a dough. Set the sponge at the same temperature

above recommended till it rises to twice its bulk. Then stir in whole-wheat flour until the dough is stiff for kneading. Knead for ten or fifteen minutes. Again return to a large vessel and permit the dough to raise till it doubles its bulk. Then knead a second time, form into loaves and put into baking-pans. For the third time set the dough now in the pans at the yeast-growing temperature. If this were white-flour bread to be made as light as possible, the rule would again be to let the dough again double its volume. But with the whole-wheat this is unattainable and our maximum of safety for this last raising is fifty per cent increase in bulk, i.e., the pan two-thirds full of dough should raise to fullness. Then we bake as before.

This process, if each step is conducted exactly right, securing the maximum raising without going beyond that point, will give a loaf of maximum lightness. But there are three chances to go wrong and have sour or soggy bread.

Hence between these two extremes the experienced teacher in bread-making usually recommends the following compromise, and I will give the recipe in fuller detail:

Two cups of milk (water may be used). If milk is used, scald it and cool to lukewarm.

A teaspoonful of salt.

A fourth of a cup of sugar or as much or a little more of molasses. (This sweetening is not essential.)

A cake of yeast dissolved in one-fourth cup of warm water.

(A little oil, butter or other fat may be used.)

Whole-wheat flour, about five cupfuls—but on this point of exact flour quantities hang many tales of failure. Whole-wheat flour absorbs more water when cold than white flour; hence the danger of soggy bread. Moreover, the flours differ; better learn to judge flour quantities by the stiffness of the dough and make the dough rather drier than white flour dough.

Add salt and sugar to the milk. When the milk is cool, add the dissolved yeast and then the flour, stirring thoroughly. The temperature of the whole should be between seventy-five and eighty. This requires that the flour should be warmed in winter, and there are plenty of places where it needs to be cooled in summer. Yeast grows most rapidly at a temperature of 86 degrees, but it is best that the temperature be under rather than over this and the higher temperature increases the danger of bacterial growth and sour bread. Where the bread in a sponge or dough is to be set over night the temperature should be between sixty-five and seventy.

Now for the stirring or kneading. The purpose is to get an intimate mixture of flour and yeast; otherwise some spots will be heavy and others get light too quickly and "fall" or sour. Stir the dough till it becomes too stiff and then take out and knead for a few minutes. Now set aside at the proper temperature to raise. If things are right it should raise to twice its bulk. Then shape into loaves without much kneading and put into the pans. Let it raise again one-half its bulk—and then to the oven.

Whole-wheat bread requires a little slower oven than white bread. If you have an oven thermometer start the bread in a temperature of 425, let it fall during the baking to about 380 at the end. The cooking time should be from one hour to an hour and fifteen minutes. Naturally this will depend on the size of the loaf. Whole-wheat bread crust is liable to bake harder than white. Hard top crusts can usually be avoided by shielding the top of the loaf with paper or tin covers during the first part of the baking process.

The above process is about as near as one can get it from printed recipes. Here is a slight modification of it: Instead of adding all the flour the first time use only enough to make a batter thick enough to drop slowly from a spoon.

Then let this batter raise to twice its bulk before adding the rest of the flour and kneading. Then put into pans and proceed as before. It is only a difference of when the last part of the flour is added and when kneading is done. Try both ways and stick to the one which produces better bread.

Whole-wheat bread is about the solidest staff of life on which frail man has yet learned to lean. Sometimes the staff is too solid. If you, or the others who dine at your table find it so you can compromise by using part white flour.

After you once acquire the fine art of judging when the yeast has bubbled just enough, then there is infinite variety of possible alterations in the ingredients. Add ground nuts and it is a nut bread; add chopped figs, dates and raisins, and it is a fruit bread.

Those who have not the facilities or time to make whole-wheat bread from yeast and who cannot buy it in the market will do well to use the rather plentiful supply of warm breads made either from whole-wheat flour or from corn meal. Warm whole-wheat or corn bread, that is—gems, muffins and even pancakes, are much more wholesome and digestible than similar preparations made of white flour. The Graham flour and the corn meal are coarser and more granular and do

not make the sticky, doughy mass that is so objectionable in warm white-flour breads. .

The following recipes for making various corn breads will serve as a guide to those inexperienced in such cookery. The making of these forms of bread from either corn meal or whole-wheat flour is much simpler than making yeast bread, and the recipes may be varied, or one who has the general principle in mind can make a wide variety of such breads off-hand without following a definite recipe.

SOUR MILK CORN BREAD

Corn-meal, 3 cups
Sour Milk, 2 cups
Salt
Soda

Stir to a thin batter, and bake in shallow tin.

CORN PONE OR ASH CAKE

Corn-meal, 3 cups Salt Water

Mix corn-meal with salt and scald with boiling water. Shape into cakes and bake in quick oven. The classic product of log cabin days was baked wrapped in green leaves and placed in the ashes, or on boards set before an open fire.

ONE-EGG CORN BREAD

Corn-meal, 2 cups
White flour, 1 cup
Eggs, one
Milk (skim), 2 cups
Cooking fat, 2 tablespoons
Sugar, 1 tablespoon
Baking powder, 3 teaspoons
Salt to taste

Scald corn-meal with one cup boiling water. Add egg well beaten, fat, sugar and milk. Sift flour with baking powder, stir to soft batter, and pour into pan in sheet three-quarters of an inch thick.

CORN MUFFINS

Butter, ½ cup
Sugar, ¾ cup
Eggs, one
Corn-meal, 2 cups
Baking powder, 5 teaspoons
Milk, 1½ cups
Flour, 1 cup

Mix cream, butter and sugar; add well-beaten eggs gradually, and milk. Then add dry ingredients mixed and sifted. Bake in individual tins.

The root vegetables are for the most part unpalatable unless cooked. There are some exceptions to this: raw grated carrots, tender turnips, or beets make an excellent ingredient for salads.

The greatest mistake made in cooking vegetables is that of boiling them in too much water and then discarding the water; both the flavor and valuable mineral salts are lost in this way. All vegetables that are boiled should be cooked in as little water as possible—many of them may be steamed in a closed pot without being covered with water. The juice that remains from the boiling of vegetables should not be discarded; it should either be used for the making of soups or should be boiled down until the quantity of juice remaining is not too great to serve with the vegetables. Such vegetable juice may be made

exceedingly palatable by the addition of either milk or butter. Almost all vegetables make delightful soups, either alone or in various combinations; for this purpose the vegetables should be cut fine, as the object is to get the flavor into the soup and not to retain it in the vegetables as when they are served as such. The mere addition to finely chopped vegetables cooked in water or milk, condensed milk or cream and a little butter makes the least expensive and the most wholesome form of soup that may be served. Do not add flour or other thickening. Potato soup, celery soup and onion soup made in this fashion are especially fine.

One of the best methods for cooking practically all vegetables is to bake them in a covered dish with a little water or milk. This method is known as "cooking en casserole." The process retains the full flavor and all the soluble mineral salts. Either milk or butter, or both are the best dressings or sauces for vegetables cooked in this fashion.

Potatoes, sweet potatoes and parsnips may be baked. In the baking of these vegetables the skin should not be removed. Wash thoroughly with a stiff brush, or wash and scrape. This will remove the dirt and the skin may be retained. Buttering or oiling of potatoes before baking will

keep the skins from drying out and make them more palatable. To pare off the skin of potatoes wastes a large portion of the substances and, as in the case of removing the bran from wheat, the most valuable ingredients are lost. When boiled, the thin outer skin is not so palatable and becomes detached in papery layers; in such case the best method is to bring the potatoes to a boil, which will loosen the outer skin, which may then be removed; after this the cooking process may be finished in any way desired. But the baking process is preferable, as no substance at all is lost; even the outer skin is delicious, and valuable in the diet for the reason that it supplies indigestible fibre similar to the fibrous element in the wheat bran.

Although there are some exceptions, as in the case of old turnips or beets in which the outer skin of the vegetable is not palatable, yet as a general rule one should retain the outer skin of vegetables and not pare it off in thick layers and discard it.

The leafy vegetables should for the most part be served as salads uncooked. Cabbage is commonly served both raw and cooked; but the uncooked cabbage used as salads or slaw is the more wholesome and digestible. Practically all green vegetables may be used in raw salads, when one

becomes accustomed to the flavor of them. For use in this form they will naturally be more appetizing if young and tender.

The purpose of leafy vegetables in the diet is to supply vitamines, minerals and cellulose or fibre. The cooking process may destroy or reduce the available quantity of vitamines and if all juice is not retained will waste the mineral salts. Hence the importance of using leafy vegetables in uncooked form. Some of the tougher and older varieties of leafy vegetables may be cooked as greens. Greens are most appetizing when served with a dressing of oil and lemon juice; those who prefer meat flavors in the diet may cook greens with a little bacon, ham or chipped beef. The chipped dried beef in small quantities is also an excellent ingredient to add flavor to uncooked salads.

The salads may be made in almost an endless number of forms, but the leafy vegetables, usually lettuce, celery or raw cabbage, should always be the chief ingredients. The salad dressing should have a vegetable oil as the main ingredient. Some sort of acid is necessary to give piquancy and flavor; vinegar is commonly used for the purpose, though I recommend lemon juice, as being the more wholesome and natural form of food acid. Mayonnaise dressing is made

of oil, vinegar or lemon juice and egg yolk. In order to make a good Mayonnaise dressing one should first beat the egg yolks until they are perfectly smooth, then drop in the necessary quantity of oil drop by drop, stirring the mass the whole time; when all the oil has been incorporated, add vinegar or lemon juice and salt to taste. Some prefer also to add some small portion of mustard. In order to get a perfect emulsion all the ingredients should be as cold as possible.

Salad dressings may also be made with the use of evaporated milk or cream to replace all or part of the egg yolks and oil. Peanut butter thinned with a little milk or water may be used in a similar fashion. Sugar may be used or omitted from salad dressing according to taste. Dressings for salads for use in the reducing in cases of obesity should substitute mineral oil for the ordinary salad oil; the recipes otherwise may be the same.

Legumes, which include beans, peas, lentils and peanuts, all require cooking to make them palatable. Peanuts are occasionally eaten raw, but most people do not care for the flavor. This group of foods is more benefited by cooking than foods of almost any other sort; not only is this true because of the improvement of flavor, but raw legumes are not readily digestible. The in-

creased proportion of vegetable protein mixed with the starch seems to be one of the most difficult to digest of all food substances; hence thorough cooking, which softens and disintegrates the substance, is really necessary. Peanut butter is made from either raw or roasted nuts—only they are not nuts at all, but belong to the legume family. The value of roasting and grinding is questioned by raw food enthusiasts.

Nuts, like legumes, are somewhat difficult of digestion because of the insoluble nature of their vegetable proteins, but in the case of nuts the additional ingredient is fat rather than starch and, therefore, they are not benefited by cooking. The important thing in using nuts is their thorough mastication. When nuts are desired to flavor other foods, they may be ground finely in a chopper. Such chopped nut meat is an excellent ingredient of salads and may also be used with cereals; or it may be added to give the nutty or meaty flavor to baked vegetable combinations, which are frequently used in vegetarian cookery to replace the meat dish of the meal.

Fruits are rarely benefited by cooking and, as in the case of leafy vegetables, I advise the use of fruit uncooked wherever possible. The exception might be taken in the case of green fruit, but the better plan is to use thoroughly ripened

fruits only, rather than to attempt to substitute cooking for the natural ripening process.

Evaporated fruits such as prunes, peaches and apricots are usually cooked, but a more natural flavor may be obtained by soaking such dried fruits over-night. If one likes a little cooked flavor they may be brought to a boil the next morning, but the prolonged cooking of evaporated fruits is wholly unnecessary.

The banana more nearly resembles the starchy vegetables than it does the true fruits. In order to get it to our markets the banana is picked green; it should not be used until thoroughly ripened. The thoroughly ripened banana has a speckled black and yellow skin; because of the bruising of the fruit, bananas often spoil before this stage of ripening is reached. Because of the starchy nature of the unripened banana its flavor may be improved by cooking. The best method of doing this is to bake the banana in its skin. Bananas may either be used in this form or used raw, if well ripened. It is an inexpensive and wholesome food, deserving wide use.

The habit of preparing fruit with too much sugar is a dietary error; the making of thick, syrupy fruits and of jellies, jams and marmalades is excusable if the appetite calls for sweets, for such dishes are certainly preferable to the

wholly denatured cane and glucose syrups. But the better method is to use the fruits uncooked, and if well ripened most fruits may be so used with little or no sugar. The better forms of sweets are the natural sweet fruits, such as raisins, dates and figs. To this list of natural sweets we may add honey. These splendid foods deserve more extensive use. They may be eaten alone or with nuts, or used to sweeten cereal dishes.

Fruit juices, or drinks made therefrom, are most palatable and wholesome. Fruit juice drinks as well as good milk are the true health drinks or beverages. Alcoholic drinks have been abolished by law, and the health of the nation would be improved if the narcotic tea and coffee were also abolished. Cocoa contains a small percentage of an alkaloid narcotic, but the nutritious ingredients of the cocoa, and particularly the milk with which it is combined, so overbalance this narcotic effect that we may place the cocoa on the permissible list for those who insist upon some form of warm drink. Cereal coffees are not particularly nutritious except for the milk and sugar they contain; but they are, of course, harmless. Their great utility has been as a substitute for the harmful coffee.

The methods of cooking, which I do not advise, either from the standpoint of health or economy,

are those in which starches and fats and often sugar are mixed together. This includes all manner of pastries, as well as many of the complicated hashes, gravies and dumplings, etc. Such methods of cookery add unreasonably to the housewife's labor and the products, while tasty, are neither digestible nor wholesome, and usually lead to over-eating. Such dishes as mince pies and plum pudding are notorious offenders. But the general list of foods made from white flour, fats and sugars with or without meat combinations are all worthless, except for their fuel or caloric value, and our conventional diet is already overburdened with food material of this sort.

Frying is the least wholesome method of cookery, especially when applied to foods containing starch. Purely protein foods such as eggs, fish and lean meats, may be fried without much injury to their nutritive or digestible qualities. If one must fry potatoes the best method is the French fried, in which the potatoes in comparatively large pieces are dropped into hot grease, so that at least the entire substance does not become saturated.

The amount of time, worry and labor expended on preparing foods in the average American household is an utterly inexcusable waste of human energy. Whenever possible foods should

be used in their natural forms, or the dishes made therefrom should be simple. Complicated and elaborate cookery serves no purpose whatever, except to waste a woman's time and lead her family to over-eating and gluttony.

As ordinarily practiced this system of elaborate cooking runs in a vicious circle. The foods are too highly flavored, and too readily swallowed without mastication. This results in over-eating. Over-eating results in loss of appetite, and with a poor appetite, and the belief that one must forever eat to keep up one's strength, comes the demand for more complicated dishes and more highly seasoned food.

The cure for this vicious system is to go back to a natural diet of simple foods, and to wait for the return of natural appetite, before eating. This will often result in the eating of less food, with the resultant loss in weight; but such loss of weight is usually beneficial. Unless a man has been educated away from the erroneous view that an enormous appetite, the consumption of huge quantities of food, and the resultant over-weight are all desirable, he will, of course, be frightened, imagine that he is starving to death, and return to his flesh-pots, and continue his health-destroying habits.

CHAPTER XI

Practical Food Economy

THE general plan of diet advocated throughout this book is neither the cheapest nor the most expensive. But it is cheaper than the conventional diet usually eaten in the American home, because it eliminates the almost universal habit of over-eating, and because it eliminates the bulk of the expenditure for meat, which is usually the most expensive item in the American bill-of-fare.

I do not, however, advocate extreme measures in food economy; outside of the emergencies of war and famine, the attempt to cut the cost of food down to the very minimum is both unnecessary and unwise. The cheapest foods used by man are the grains, and the cheapest grain in this country is corn, but a diet in which grain products and especially commercial corn-meal and white flour predominate is decidedly deficient and will not maintain life and health. Some of the poorer families in the South live largely on commercial corn-meal, white flour, fat pork and molasses. The result is a weak and badly nourished race on which the terrible pellagra inflicts such havoc.

If the cereal foods be used in the form of entire grains, particularly in the case of wheat, their dietetic deficiencies are partly (not wholly) overcome. Even in the most wholesome and appetizing form cereals neither supply all elements of nutrition, nor are they sufficiently palatable to recommend their use to the exclusion of other food.

The least expensive and most effective way to overcome the deficiencies of cereal foods is by the addition of milk and leafy vegetables.

This combination, therefore, makes the cheapest safe diet known. In country districts where whole-wheat, milk and green vegetables may all be had at comparatively low prices, a man can live on such a diet and be adequately nourished at the cost of a few cents a day. All diets attempting to cut the cost of food to a minimum should include these three ingredients. The whole wheat, of course, may be used in both the cereal and the bread form; corn products may be substituted for the wheat in part or in whole, if the diet is sufficiently fortified with the milk and greens.

In addition to the above three groups of food the appetite will crave some form of fat, and also sweet. The most economical way to secure these would be in the form of vegetable oil and sugar;

here again we may say that if plenty of whole milk and leafy vegetables are used the deficiencies of such oil and sugar may be overcome. The safer plan, however, and certainly a more desirable one from the standpoint of palatability and variety would be to use a portion of natural sweet fruits, and some genuine dairy butter.

For the purposes of illustrating how these principles of food economy work out, I will give below three menus, figuring these three degrees of simplicity and showing the comparative cost of each. Of course, all prices of foods are subject to change without notice, and the reader interested in the subject will have to re-figure the cost according to the price list he would have to pay.

THE LOWEST COST MENUS

Three-quarters of a pound of Whole Wheat	$ .02
Half a pound of Corn-meal or Hominy	.02
One quart of Whole Milk	.10
Half a pound of Leafy Vegetables (Lettuce, Raw Cabbage or Greens)	.05
Cost per man per day,	$ .19

Three-quarters of a pound of Wheat	$ .02
One-quarter pound of Corn-meal or Hominy	.01
One quart of Milk	.10
Two ounces of Sugar	.01
One ounce of Vegetable Oil	.02
Half a pound of Leafy Vegetables	.05
Cost per man per day,	$ .19

Of course, the preceding menus are doubtless too monotonous and unpalatable to the average individual for practical, or at least permanent use. The following menu, with ingenuity of cooking and serving of ingredients, would about be at the bed-rock of practical economy for universal use.

Six ounces of Whole Wheat	$ .02
Two ounces of Corn-meal or Hominy	.01
Two ounces of Oatmeal	.01
One quart of Whole Milk	.10
One ounce of Sugar	.005
One ounce of Butter	.03
One ounce of Vegetable Oil	.02
Two ounces of Dates or Raisins	.02
Four ounces of Potatoes or other Roots	.01
Quarter pound of Leafy Vegetables	.025
Cost per man per day,	$ .25

The above menus are given to illustrate the basic principle by which food economy must be achieved rather than as practical menus of real use. The food quantities given in each case approximate 2,500 calories and hence furnish enough fuel food for the average man. But there will be very few readers of this book who will see fit to attempt such extreme economies in the diet.

The addition of greater variety to the diet will naturally enhance the cost. A moderate amount

of such variety and such increased cost are usually worth while to all who can afford it. Palatability, the pleasure of eating, is worth paying for to a moderate degree. It is only when this catering to the appetite results in excessive expense, and particularly when the extra expense adds no true improvement to the diet, that it is to be condemned.

All readers who read the previous chapters of this book will be fully impressed with the fact that the quantity of fuel value, which the scientists measure in calories, does not tell all we need to know about food. Yet since the fuel value is one element that must be considered, and because it is the only element that can be easily reduced to a numerical figure, this quantity of fuel or caloric value is usually taken as the basis in figuring food economy.

Such figures are interesting and instructive, and are of some practical value to those who comprehend that the fuel value of food is only one element of food quality and that other factors must also be considered. I do not expect any reader to compute the number of calories in his daily diet—such a mathematical calculation is too troublesome—but there are practical daily questions that every one interested in daily food economy must answer. For illustration: Are

eggs at fifty cents a dozen more economical than milk at sixteen cents a quart? Are potatoes at four cents a pound cheaper than bread at ten cents a pound? Are raisins at fifteen cents a pound more expensive than grapes at five cents a pound?

In order to enable the reader to answer such questions I have devised a table which will show the comparative worth of various foods at various prices. At the left hand side of this table you will find the more important foods listed. These foods are grouped according to their caloric value, which, of course, has nothing to do with the natural food groups that we have elsewhere discussed as the basis of planning a complete or balanced menu. Across the top of this table you will find, given in bold type, figures which indicate various prices of these foods per pound. In the case of eggs, only, these prices apply per dozen. In the case of milk, the price should be considered per pint, which, of course, is approximately a pound.

The figures in the body of this table represent the cost of 2,500 calories, providing the price per pound be that given at the head of the column. I chose the unit of 2,500 calories as that approximates the fuel value required by the average man for one day. This enables you to think of these

TABLE SHOWING RELATIVE ECONOMY OF VARIOUS FOODS AT VARIOUS PRICES

FOODS GROUPED ACCORDING TO CALORIC VALUES.	FIGURE AT HEAD OF EACH COLUMN IS PRICE PER POUND.												
	2	4	6	8	10	12	15	20	25	30	40	50	75
Vegetable and Animal Oils and rendered Fats	.01	.02	.04	.05	.06	.07	.09	.12	.15	.18	.24	.30	.45
Butter, Margarine and Meat Fats (not rendered). Nuts not elsewhere mentioned.	.02	.03	.04	.06	.07	.09	.11	15	.19	.23	.30	.37	.57
Cocoanuts, Almonds, Bacon, Peanuts, Peanut Butter	.02	.03	.05	.07	.08	.10	.12	.17	.21	.25	.33	.42	.63
Cheese, Cookies, Crackers, Sugar, Oatmeal, Popcorn	.03	.06	.09	.12	.14	.17	.21	.28	.35	.42	.56	.70	1.05
All dry Cereals, Flours, Beans, Peas; Honey, Dates, Raisins, Figs, Cakes, Sweet Condensed Milk	.03	.06	.09	.12	.15	.18	.22	.30	.37	.45	.60	.75	1.12
Biscuits and Rolls, Syrups and Prunes	.04	.08	.12	.15	.19	.23	.28	.38	.47	.57	.76	.95	1.43
All Breads, Jams, Jellies and Preserves; Average Lean Beef, Ham or Mutton; Lean Pork	.04	.08	.13	.17	.21	.25	.31	.42	.52	.63	.84	1.05	1.57
Eggs (measured by the dozen, not pounds)	.05	.10	.15	.20	.25	.30	.37	.50	.62	.75	1.00	1.25	1.87
Mature Poultry; Lean Beef; Salmon; Evaporated Milk; Custard and Pumpkin Pies; Puddings	.06	.12	.18	.24	.30	.36	.45	.60	.75	.90	1.20	1.50	2.25
Salt Codfish; Young Poultry; Sweet Potatoes; Baked Beans; Cottage Cheese; Fresh Lima Beans	.09	.18	.27	.36	.45	.54	.67	90	1.12	1.35	1.80	2.25	3.37
Potatoes, Bananas, Grapes, Plums, Green or Canned Corn	.12	.24	.36	.48	.60	.72	.90	1.20	1.50	1.80	2.40	3.00	4.50
Oysters, Fresh Codfish; Parsnips; Whole Milk (by the pint); Green or Canned Peas; All Fruits not otherwise mentioned	.15	.30	.45	.60	.75	.90	1.12	1.50	1.87	2.25	3.00	3.75	5.62
Melons, Strawberries, Cranberries, Pineapples; All Vegetables not otherwise mentioned	.30	.60	.90	1.20	1.50	1.80	2.25	3.00	3.75	4.50	6.00	7.50	11.25

figures as meaning what it would cost a man to live per day if he ate only the food under consideration. Certainly I am not advising any one to live on a single food even for a single day, but the idea of the cost of food per day is a term that has some practical significance, while the phrase 2,500 calories sounds purely scientific and theoretical.

Now to apply our table. Suppose we wish to answer the question suggested above; eggs are fifty cents a dozen, milk is sixteen cents a quart; we want to know whether we can afford to substitute eggs for a portion of our milk. We look at the word "eggs" and trace the horizontal until we come to a column headed "50"; here we find the figure "1.25," which is the cost of 2,500 calories of eggs at fifty cents, or what it would cost a man to live a day on an exclusive egg diet. We now find "fresh whole milk;" sixteen cents a quart will be eight cents a pint or pound; we therefore look in the column headed "8" and find the cost of 2,500 calories of milk will be sixty cents, which would be the daily cost of living for a man on a milk diet.

Now take the example of bread versus potatoes; by consulting our table we will find that for bread at ten cents a pound loaf, the cost will be 21 cents a day, whereas potatoes at four cents

a pound will cost 24 cents a day. Potatoes at four cents a pound are not, therefore, an economy, compared with bread at ten cents; but suppose potatoes came down to two cents a pound and bread to eight cents; we now find the comparative cost to be 17 cents for bread and 12 cents for potatoes.

This table of comparative food values will, I believe, be very helpful in showing you the comparative worth of different foods at different prices. You will probably find, by running through the table with a number of foods you use, that you have entertained some false ideas as to what foods are most economical. The figures of the table are only approximate, being computed to the nearest whole number, but it is amply accurate for all practical purposes.

I can not caution you too strongly against considering this matter of food economy as the entire or even the principal fact about foods that needs your attention. Much harm has been wrought by the over-emphasizing of the caloric value of foods. For illustration: To substitute cereals for milk in the feeding of children because cereals furnish calories at a cheap rate, is a crime too obvious to need explanation. Again the white flour millers have repeatedly defended their product because of its high caloric value and ap-

parent economy. It is just as sensible to tell a man to run his automobile on kerosene because he can buy more calories per gallon in kerosene than he can in gasoline. But even this illustration is not forcible enough, for engineers may yet devise an automobile engine that will run better on kerosene than it will on gasoline, but the chemist of the white flour millers will never be able to devise a man who will run better on denatured white bread than he will on the whole wheat product.

Among the most common errors in food economy made by the American housewife are the over-use of meats, the over-use of canned goods, and the attempt to use fresh fruits and vegetables out of their natural seasons.

Fat meats are cheap when considered on a basis of calories, and they are utterly worthless on any other basis—but cheap as they are, fat meats and animal fats are never as cheap as the more wholesome vegetable oils. The various oils and cooking fats made from either cotton-seed oil or cocoanuts are the most economical of all fats. The use of such fats is to be recommended for economy, provided they do not crowd out all true milk or butter fat from the diet.

Lean meats are never a cheap source of food from any standpoint whatever. Lean beef, even

at thirty cents a pound, considered for its fuel value, is fifty per cent more expensive than milk at sixteen cents a quart; but fuel value is the least important thing to consider in the comparison of meat with milk; and from every other standpoint the meat is inferior for most people.

The use of canned goods is extravagant merely because of the expense of this method of preservation. The cans often cost more than the food that is put into them. The canned goods habit is one that the housewife falls into because it saves her time and labor, but the canned food diet is inferior to one of fresh fruits and vegetables, or in many cases to dried fruits and vegetables. I certainly hope to see an increased development of scientific drying or desiccating as a means of preserving food to replace the present over-development of our canned industry. The extravagance of canned goods is seen at its worst in the case of pickles, preserves and tit-bits of various sorts, which are put up in fancy small tins or bottles and sold at perfectly ridiculous prices.

While I dislike to say anything that will discourage the use of fresh fruits and vegetables, yet it certainly is not economical to attempt to use these products when nature does not produce them except under hot-house cultivation. There are too many wholesome foods of these groups

that can be had, either fresh or cheaply preserved, at any season of the year, to excuse the use of December strawberries or similar extravagances, merely to out-do one's neighbor, or because they have been given in some menu one is trying to follow. This argument also applies with considerable force to the use of eggs; this excellent food is usually reasonable in cost in the spring and summer, but unreasonable in cost, except for the inferior storage grade, in fall and winter.

CHAPTER XII

Eating for Strength and Muscular Efficiency

THE earliest food chemists believed that protein foods, and especially lean meats were the best foods for giving one strength and energy; such a conclusion was only natural with their limited knowledge. Muscles were composed of protein, hence it seemed to follow that to gain muscular strength, one should eat similar substance, i.e., the muscles of animals.

The error in this reasoning was in assuming that the muscle in being exercised, or creating energy, consumes itself and, therefore, would need food substance of similar nature to replace the waste. This view we now know to be wrong, and that the muscle acts merely as an engine in which is oxidized or burned food fuel in the form of blood sugar. This blood sugar may be derived from protein, but that is not the best source from which to get it.

The protein theory of muscular strength was first shown to be an error by two European scientists who climbed Mont Blanc on a diet con-

taining no protein. They showed that the loss of body weight during this arduous task was not sufficient to explain the origin of the energy acquired from the destruction of their own muscular tissue. As they ate no protein food they concluded that the source of muscular energy must come from the fat and carbohydrate foods which they consumed.

This belief that protein foods were the source of muscular energy died very hard in the scientific world. It is by no means dead yet in the mind of the man in the street, who believes that he must eat meat to keep up his strength. There is perhaps just a slight bit of truth in this still popular belief in the strength-giving qualities of meat. That effect is probably due to a slight immediate stimulating effect.

In my own experience as a wrestler, many years ago, I tried out various kinds of diet and observed their effects upon myself very carefully. I found that meat would increase my actual strength, but would lessen my endurance. I could lift a heavier weight under the influence of the diet in which meat was liberally supplied, but I could not lift a lighter weight so many times. I also discovered through those early experiments that eggs did not have this unfavorable effect on my endurance, though they seemed nearly, if not

quite equal to meat as a means of supplying immediate strength. Both strength and endurance were essential to my work as a wrestler, and in my efforts to attain my greatest possible strength without loss of endurance, I adopted, after many long experiments, a diet containing a limited quantity of meat. I ate eggs frequently, but did not use meats oftener than once in two to four days; the bulk of my diet consisted of eggs, whole wheat bread, vegetables and fruit. Upon this diet I maintained such a fitness that no competitor ever gained a single fall from me in my favorite style of wrestling, though many of my opponents weighed from fifteen to fifty pounds more than I.

The evidence that a heavy meat diet is beneficial in increasing immediate strength is not as overwhelming or convincing as the evidence against meat in matters of endurance. For illustration: in a long distance race of 125 miles, which was run some years ago between Dresden and Berlin, there were thirty-two entries, twelve of whom were meat eaters and twenty vegetarians; the race was won by a vegetarian who was eight hours in advance of his best meat-eating competitor. Only three of the meat-eaters out of twelve finished the race within the prescribed time of forty-five hours, but ten of the vegeta-

rians finished. The winner of the race had been a vegetarian for nine years and ate but two meals a day; his diet consisted chiefly of whole wheat bread and uncooked fruits and nuts; he had discarded legumes (beans, peas, etc.) from the diet, maintaining that they required too much vital force for digestion—a conclusion well borne out by present scientific knowledge.

More recent scientific investigation has thrown much light upon this question of the diets best adapted for the production of the greatest strength and efficiency. This investigation of Horace Fletcher and his associates, to which reference has been made, indicated very clearly that a low protein diet resulted in superior physical efficiency. Mr. Fletcher himself broke several records at the Yale Gymnasium that had been made by the best of the college athletes. This achievement astonished the world because Mr. Fletcher, at the time was over fifty years of age and had not trained particularly for these tests, as had his youthful and over-nourished competitors. Fletcher's diet contained very little meat, the small quantity of protein being derived from milk and eggs. The systematic and carefully supervised experiments which were conducted at Yale following these demonstrations all gave convincing evidence that a minimum diet with

very little protein, and "Fletcherized," that is, eaten slowly and exceedingly well masticated, would materially increase the endurance and efficiency.

When these experiments were made Mr. Fletcher gave the chief credit to mastication, while the scientists of Yale gave the chief credit to the low protein—both of these factors undoubtedly contributed toward the results. But in the light of very recent experiments we should also give credit to the reduction of the total quantity of food.

The limit of a man's physical endurance (which means his practical strength in all muscular operations, enduring for more than a few seconds) is due to the following causes: the limit of the breathing capacity; the limit of the capacity of the heart to carry fresh blood to the muscles; the accumulation of fatigue poisons.

As to the matter of breathing, there is no way to improve one's power in this respect, except by developing chest expansion and lung capacity. In the matter of circulation, as influenced by the rate of the heart-beat, some interesting facts were discovered during this test at the Y. M. C. A. College on the restricted diet. The pulse rate of the men on the restricted diet decreased; this would indicate that a less rapid flow of blood was

necessary to furnish the required fuel and remove fatigue poisons from the muscles. Now, when these men were put through a tread-mill test, it was found that though their pulse rate was increased by the exercise it did not go nearly so high as the pulse rate of full-fed men; it would seem from this that the men on this minimum diet would have latent powers of endurance, because of this capacity to keep up a given amount of energy production with a lower pulse rate. The seeming truth of this reasoning is borne out by the practical observations of the increased endurance upon an abstemious diet.

Fatigue is caused by the accumulation in the muscle cells of the waste products of their activities. These are constantly being removed by the blood stream, but the continued activity results in a certain accumulation in excess of the capacity of the blood to remove the waste. Some of these waste products are similar to those found in meat and the proportion of such products in meat would depend somewhat upon the degree of fatigue of the animal at the time of its death. It is thus argued against a meat diet that it adds to the fatigue poisons of our own activities, and others derived from the animals of which we eat.

The use of excessive protein, either of animal or vegetable origin seems to have a somewhat

similar effect, for the protein which is not used by the body must be broken down into similar waste products before it can be eliminated from the body. The general sense of physical fitness derived from the use of a light diet and preferably a light protein and meat-free diet is probably to be explained by this greater freedom from fatigue poisons.

The weight of the body and the amount of fat has an obvious effect upon muscular strength and efficiency. Any one knows that a fat man is weak and clumsy and that an athlete should train down to hard muscle before he can hope to win against his competitors.

In the past, however, athletes have often attempted to take off their fat by exercise, while still living upon a diet, the tendency of which was to put fat back on them. The exercise is certainly essential, but the task of training is made much more difficult where exercise and diet are thus at war with each other.

Probably the most efficient condition of the body is one in which the fat is reduced almost to the vanishing point. Just where this point is, is not easy to determine, for the reason that there is much fat deposited throughout the body, the presence of which does not show upon the surface of the body. In the experiments on re-

stricted diets quoted in our chapter on "How Much to Eat," the young men, though athletic to start with, all lost ten per cent of their weight, and yet were able to keep up their strength. In fact, the comparison of the strength of these before and after losing this ten per cent of weight, was so close that, for the group as a whole, the averages showed that they had gained a little strength in one hand and lost it in the other. In the chinning tests several of the men on the restricted diet broke their previous records made on a full diet; eight out of twelve of these men held their arms extended for one hour.

I do not believe that these men could have shown such muscular efficiency if their loss in weight had been chiefly in muscular tissue, for such a loss from a 150-pound man would mean fifteen pounds, about one-fifth of his total muscular substance. The weights and photographs of these men showed them to be, at the beginning of the experiment, in about the condition of the average athletic individual who is eating rather heavily and training moderately. Such men evidently carry some surplus fat which they can afford to lose without any loss of strength.

The actual fuel burned in the muscle is physiological glucose or blood-sugar; it, therefore, follows that such sugar is the most easily avail-

able for the production of muscular energy. When the free supply of this blood sugar is consumed, the fat, either direct from the food or from the body, is next drawn upon, being converted into sugar before it can be utilized in the muscles. After all fat is exhausted, as in the case of a starving man, then and only then do the muscles consume themselves or burn protein. When this point is reached, strength deteriorates rapidly and weakness and ultimately death occur. As long as there is a supply of sugar in the blood, or stored in a slightly altered form of glycogen in the liver, body fat will not be drawn upon; on the other hand as long as there is fat in the body the muscles or other active tissues will not be consumed.

From these statements we can draw the following conclusions: First, the best form of nutritive energy is that of blood-sugar; and as long as the supply of this is not exhausted nothing else will be consumed. (The loss of weight that occurs in ordinary athletic contests is chiefly due to the loss of weight of water.) Second: so long as man has any appreciable amount of fat in his body neither exercise nor the reduction of the diet can cause the destruction of his vital tissues or cells by muscular work.

As a practical application of these principles, in recommending a diet for muscular strength and endurance, we must place first in the list the foods that will produce blood-sugar. These foods in order of their ease of digestion and quickness of assimilation are as follows:—First: The natural food sugars, such as dates, raisins, grapes and honey. Second: Artificial sugars, granulated sugar and syrups. Third: Starches. Fourth: Fats. Fifth: Protein. This rating of foods in order of their readiness for blood sugar production does not, of course, mean that the athlete should disturb the fundamental basis of a complete diet. The salts, vitamines and high efficiency proteins are required for the athlete as for any one else, but for the additional food that his extra exertions require, or for the immediate food to be used just prior to or while undergoing such exertion, the list as given shows the order of preference. The use of chocolate for soldiers on the march is well founded, as the sweetened chocolate so used is chiefly sugar with a smaller proportion of fat. Except for the matter of flavor plain sugar would do as well. But I believe the very best foods that can be found for this especial purpose are dried sweet fruits.

Part of the argument in favor of the use of

such special foods during, or immediately preceding strenuous exertion rests on the fact that these foods require the least consumption of energy for their digestion and are least likely to make trouble with indigestion when the blood is drawn away from the alimentary tract, because of the vigorous use of the muscles. Do not overlook the fact that the digestion of food consumes considerable energy—particularly is this true of protein food. This energy spent on digestion adds nothing to the energy available for muscular exertion, but only puts an additional burden on the heart and lungs. In exerting the muscles for a few seconds the limit of strength is one of actual muscular power, but in endurance the limit is the ability of the heart to circulate the blood and the lungs to purify it. Here perhaps we see the reason why the meat diet does not effect strength but does effect endurance.

Where food must be taken during severe physical labor the foods requiring the least energy in digestion are obviously indicated. But it does not follow that one should be eating all the time during strenuous labor. Such use of sugar foods is necessary only during long marches, long cycling, swimming and walking contests, where the activity must be kept up

constantly for hours or perhaps days. For ordinary athletic events it is much better to enter the contest with an empty stomach; the last meal should be taken several hours before such competition, and nothing can be superior for such a meal than sweet fruits with perhaps a glass or two of milk.

The eating of ordinary meals containing starches, fats and protein difficult to digest during periods of specially strenuous labor is a mistake—complete fasting would be better. This fact is well illustrated by the experience of as engineer who was working a twelve-hour shift alternating with a man who had the habit of not showing up, the result being that the reliable man sometimes had to work thirty-six hours at a stretch. The company very kindly provided a full meal, sent from a restaurant, every six hours. The result of a couple of such experiences was a serious case of illness. The next time it happened the engineer refused the food and went through the thirty-six hour shift on a fast; he then went home and had his sleep out, and came through the experience as fit as a fiddle.

Just as it is inadvisable to eat heavily immediately before or during an athletic contest, so one should not eat heavily immediately after.

It is highly important for the man who indulges in heavy exercise or labor for limited periods and has long periods of rest or light labor in between, to adapt his diet to the changed condition. Otherwise the habits of eating necessarily adopted during the periods of strenuous labor will be continued, the result is that he will be over-fed, even if he does not actually get fat. Such over-feeding will result in a stuffed and inefficient condition. He is particularly likely not to notice this, as the shrinkage of the muscles due to the discontinuance of exercise will permit of a considerable accumulation of fat before it becomes noticeable.

A great deal of time and physical efficiency is lost by boxers and other seasonal athletes in getting into and out of training. If their diet was more carefully adapted to their actual needs from time to time, getting back into shape would be much easier accomplished. But the worst mistake of this sort is that made by the average business man who spends his youth as a boy on a farm, or athlete in a college and acquires a hearty appetite, and then tries to keep up his eating capacity after he settles down into a swivel chair and indulges in nothing more strenuous than getting into and out of an automobile.

To attempt to prescribe the exact amount of food that should be eaten by the man doing heavy physical labor, and particularly by the athlete, is even more difficult and impracticable than to prescribe the amount of food for those of sedentary occupation. This difficulty will be readily seen by a glance at the following figures, which show the consumption of food energy under different conditions of physical activity.

	Calories per hour
Sleeping	65
Sitting	100
Walking slowly	170
Walking rapidly	300
Running, six miles per hour	500

From such figures it is seen how very great are the differences of energy consumption with different forms of exercise. Hence to calculate how many calories per day an athlete would need, we would have to know the exact number of minutes engaged in sleeping, standing, sitting, walking and running, and so forth. Even this exact degree of exertion in all these conditions could not be known, to say nothing of the factors of the size of the man and his individual physical efficiency in converting food into energy—hence the absurdity of all such efforts to prescribe the exact amount of food that any man should eat.

We can also note from the above figures that the rate of consumption in such exercise as running would amount to 5,000 calories for a ten-hour day; a man who ran twenty-four hours—and it has been done—would consume 12,000 calories. All such figures are away above the capacity of a man to digest and assimilate food, hence these especially strenuous endurance tests are only possible from the temporary consumption of food stored in the body with the result that such special exertion causes a temporary loss in weight.

As a practical problem the athlete should gauge the amount of food eaten, not by calculation of calories, but by the weight of the body and the sense of physical fitness. The more muscular energy expended the greater will be the amount of food needed; but it does not follow that excessive eating will increase the muscular powers; quite the contrary is true. The ideal, in any case, is to eat just enough to sustain the general average expenditure of food energy. The muscles work more efficiently and endurance is greater when the body is not clogged with an excess of nutritive elements, and the vitality wasted first in digesting and then eliminating the useless surplus. Therefore, it is much better to keep the average food consumption down near the

minimum, even if it results in loss of body weight during the times of severe exertion, than it is to attempt at all times to eat enough for those periods of special energy expenditure, with the result of over-eating at other times and a general lowering of efficiency.

CHAPTER XIII

Food and Mental Efficiency

SAVAGES are reputed to have eaten the hearts of their enemies in order to acquire their courage. Civilized men, even scientists until very recently, believed that we should eat the muscles of the ox in order to acquire the strength of the ox. But I am not aware that anybody has ever advocated or practised eating of brains in order to benefit mentally.

Another superstition that seems even less plausible did arise, and is still believed in by some people; it is that fish is a brain food. This unwarranted belief was founded upon the somewhat accidental discovery that both the human brains and the meat of fish contain phosphorus. As a matter of fact many other foods are now known to be richer in phosphorus than fish, whereas phosphorus is a very minor element in the composition of brain substance. None the less the incomplete knowledge of the early chemists gave rise to the belief in fish as brain food, and also to a slogan of the early German materialists who said *"Keine Phosphor, keine Gedenken."*—"No phosphorus, no thought."

The Physiology of the brain and the function of thinking are much more complex matters and less comprehended by science than are the physiology of the muscles and the function of muscular exercise.

The brain is composed chiefly of protein, but there is also a little highly specialized fatty substance known as lecithin, which is also present in egg yolks. As the action of the muscles does not consume its substance, so the action of the brain does not consume its substance, but, whereas muscular action consumes a very substantial quantity of food fuel, brain action does not consume any substance in quantities that science has been able to measure.

Yet brain action does require, perhaps we should say, results in an increased flow of blood to the brain. This blood is arterial as it flows to the brain and venous blood when it leaves the brain, showing that chemical changes—oxidation at least—do take place. That the effect of mental work in increasing oxidation cannot be measured, as can the effects of physical work, may merely be due to the fact that the brain forms only two per cent of the weight of the body, hence the effect of its labors would be too small to notice in comparison with the total metabolism going on in the body. Thus a man thinking with relaxed

muscles would seem to show less metabolism than another who sat apparently still but with tensed muscles. For these reasons the amount and nature of food required to produce thought cannot be measured and hence the belief has arisen that mental work does not consume food at all. This conclusion can at present be neither proven nor disproven, and we cannot state what is the exact purpose or effect of this extra flow of blood during brain activity, but that it has a purpose, we cannot doubt. Moreover, we do know that anything that interferes with the flow of blood to the brain, or any impairment of any such quality of that blood will interfere with brain action and reduce mental efficiency.

Some inference might be made as to the nature of essential "brain food" from the fact that a lack of one of the vitamines causes the dull sleepiness which ends in paralysis, as observed in pigeons and other experimental animals. It is probable that there are essential substances, minute in quantity, which are consumed in brain activity and the lack of which may cause mental inefficiency, insanity, and probably death. This problem science in the future may yet unravel.

No appreciable amount of bulkier food substances such as ordinary proteins, carbohydrates and fats are concerned in brain activity. The

brain wastes the slowest of any organ or tissues (with the exception of the bones) during fasting or starvation. Nor is the brain substance materially impaired by fasting. Barring the disturbing elements of the sensation of hunger which in fasting largely disappears after the first few days, the brains seem to work very well without the usual food supply. Upton Sinclair wrote a play during a two weeks' fast. Dr. Benedict reports that a professional faster was in first-class mental condition at the end of a thirty days' fast and made a speech in which he gave evidence of a keen and wide-awake mind.

To take up more practical considerations, we find that many of the world's greatest thinkers are light eaters and attribute their superior mental efficiency, in part at least, to their abstemious diet. Thomas Edison, whose record for long hours of high grade mental work has never been surpassed, insists that his capacity for a twenty-hour working day is due to his light eating habits, and his abstinence from alcohol and stimulants.

The heavy eater is unquestionably less efficient mentally than the man who eats just enough to maintain a minimum body weight and supply the energy for his physical activities. More particularly the effect of over-eating upon brain effi-

ciency can be observed immediately after the eating of a heavy meal. In addition to the more general effects of over-eating we have here the specific effect of the withdrawal of the blood supply from the brain to the digestive organs; the result is a lazy or sleepy feeling.

So important is this effect of the heavy meal upon the mental efficiency that it is generally recognized by efficiency experts who deal with high grade mental workers. One such efficiency engineer, in handling a large force of buyers for a firm in New York, laid down as a first rule that they should not have lunch before one o'clock; a second rule was that they should not consummate any important deal after lunch. In other words they should not do important business at all on a full stomach. In this manner he circumvented the practice of salesmen who were in the habit of taking his buyers out to lunch, giving them a good feed and then, over coffee and cigars, while they were in good humor—in other words, robbed of their mental alertness—putting across a good deal for the salesman, but a poor deal for the buyer's house.

The digestion of food itself consumes energy, as I have elsewhere pointed out; it increases the total activities of the body as measured by the amount of oxygen consumed, but these increased

activities, unlike those of exercise, seem to deaden rather than to stimulate mental activity.

The effects of a continuous light diet upon the mental power were observed in the case of the Y. M. C. A. College men whose physical tests on reduced portions we have already recorded. These men while on half their former food supply maintained a ranking in their college grades that averaged about two per cent better than their previous college records, with the unlimited heavy diet, or the records of fellow classmen not on a reduced diet. Some detailed psychological tests seemed to show a decrease of certain mental powers, but there was no change sufficient to be observed by the men or their associates or that seriously interfered with their intellectual powers.

In their diaries many of the men remarked they felt freer from logginess and dullness, and more mentally fit; others complained that their increased hunger made them restless and disturbed in their studies.

Remember that these men were living on an extremely restricted diet, considering the amount of physical exercise they were taking. The probable best results in mental as well as physical efficiency would be a happy medium of nutrition between the over-eating habits of the average

man, and these half rations of wartime experimenters.

While there is probably no need, in ordinary life, of the extreme dietetic restrictions of these experimental subjects, yet unquestionably light eating habits are essential for those who wish to prolong their lives and do superior mental work. It is equally important for the mental worker to arrange the proportioning of his meals so that his chief labors of the day will not come during those hours when he is digesting his chief food supply for the day.

Either of the following plans will be suited to the worker whose mental labors are performed during ordinary office hours:

PLAN I.

No Breakfast—or at most nothing more than a cup of hot water, flavored, if desired, with a little milk or fruit juice.

Or very light Breakfast of fruits.

Moderate Lunch, such as light sandwiches, Whole Wheat Bread if possible.
Milk
Salad

Full Dinner at 6 P.M.

PLAN II.

Moderate Breakfast—such as Fruit, fresh or evaporated.
Light Cereals
Milk or Eggs
Whole Wheat Bread and Butter

At Noon—take a recreational walk
Or at most take nothing more than a
Glass of Milk
An Egg-nog, or
Fruit Juice at a Soda Fountain.

Full Dinner at 6 P.M.

PLAN III.

Begin the day with some fairly active exercises, ending in a brief walk, if convenient. After a brief rest take a hearty breakfast.

Breakfast: This meal should be the heartiest meal of the day. You can be assured of an appetite for it, if you follow the entire régime—that is, go to bed at least moderately hungry. This meal can consist of:
Eggs or meat, as desired.
Potatoes prepared to suit the taste or whatever other vegetable may appeal to you.
Salad, if desired.
Whole Wheat or hot Corn Bread and Butter.

At one o'clock, or five or six hours after you breakfast, take a moderately hearty meal, depending entirely upon your appetite. It should not be as hearty as the morning meal.
Eggs, if desired.
Vegetables or Salad.
Whole Wheat Bread and Butter.
Sweet Fruits as dessert.

No evening meal.

If you make milk a part of your diet, take a pint or whatever quantity of milk you may desire at this time. When taking milk it is better to take a glass at a time and allow a few minutes to intervene between glasses. Remember, don't drink milk; *"eat"* it, as previously described.

Mental workers whose work need not be confined to the usual office hours, very frequently do their best work when other people are sleeping, either by sitting up at night, or preferably, by forming a habit of early rising. For such workers I suggest either of the following daily food régimes, though I strongly recommend the early rising habit.

PLAN I.

Rise very early, say from 4 to 6 A.M.
Take a glass of hot water or a little fruit.

Work steadily without further food until the important creative work of the day is done, then partake of a moderate meal.

Devote the afternoon to physical recreation, or lighter work.

Eat supper early and spend the evening in mental recreation, or light mental work.

Go to bed early.

PLAN II.

Rise late, 8 to 10 A.M. Take vigorous morning exercise, followed by a bath and eat moderate late breakfast, or early lunch.

Work at creative work or other occupation during the day without further eating.

Have full dinner rather early in the evening. Then spend at least two hours in mental recreation.

After the meal has been digested, settle down for the creative work of the night and work as late as the mind will function vigorously. Sleep the next morning till you are fully rested.

Let me say in conclusion that while science has not discovered any particular brain foods, both science and practical experience teach us the great importance of maintaining a high degree of bodily efficiency as the basis of mental efficiency. The rules for mental efficiency are merely the rules for correct living generally; physical efficiency, health and long life can all be attained on a program of living that develops the best brain power. Most people are dull mentally because they are stuffed up from over-eating and under-exercise. Either proper eating or proper exercise will benefit mental efficiency, but a proper balance of both will attain the best results of all.

CHAPTER XIV

Eating to Gain Weight

IN this and the following chapter we will consider the question of eating from the standpoint of changing the weight of the body, but before one sets about to change the weight of the body, with the view of attaining an ideal weight, he, or she, should know what the ideal weight is.

This question of the ideal weight must ever remain an individual one; no two people, even of the same sex are born with the same inherited capacities for bodily growth and development. Not only is there a difference in stature which once attained cannot be materially altered, but there are fundamental differences in build or type which should be considered. Some frames are heavier than others, the bones are actually larger; also there are differences in relative breadth of frame in relation to height.

The muscular development is far more within the control of the individual than the skeleton, or the size of the vital organs. Most people under civilized conditions are sadly lacking in

muscular development; only a very few attain the full, maximum muscular development of which they are inherently capable. Almost all men, and more certainly all women, could materially improve the muscular development by muscular exercise. But even with the most thorough régime of physical exercise there will still be distinct differences in the degree or heaviness of muscular development. Some will develop large and exceedingly strong muscles; others, even with the same exercise, will develop muscles of a lighter type, perhaps adapted to dexterity and speed or wiry endurance. When all these facts are considered it is seen that any table of ideal weights, even properly arranged for heights and sex, will still fail as a guide for a particular individual. The far better source of knowledge from which to determine the ideal weight is a well trained conception of the ideal—or more properly ideals—for there are distinct types—of physical beauty. This sense for bodily beauty is instinctive in us all, but may be cultivated by the observation of such beauty, as expressed by painters and sculptors, or even better, as observed from the development of living individuals or their photographs.

One point of caution only is needed—the ideals of physical beauty have not always been

maintained upon the basis of the admiration of physical efficiency or muscular development. The ancient Greeks did maintain such ideals and the imitation of their art has done much to preserve these ideals even in ages when the original ideals of physical development were lost to a world struggling between the puritanical conception that everything connected with the body was indecent and unclean, and the licentious conception that the only physical beauty was that which would stimulate passion and lust.

The practice of the puritanical world has usually been to hide the body, particularly the female body, or to distort it with mutilations achieved by insane fashions in dress. Happily these absurdities have largely disappeared from the mind of the present generation and the styles in clothing of the present day, though by no means perfect, are more sensible and more artistic than anything that has prevailed since classic periods.

The absurd fashions, now happily disappearing, seem to have had a dual purpose. On the one hand was the puritanical element insisting upon the complete hiding of the form with a superabundance of clothing, and on the other hand the licentious element which attempted to exaggerate the distinctive features of the female

form by restricting the waist and giving undue prominence to the bust and hips.

Some of the models used by artists, in this age of absurdity, were of the type that unduly accentuated this "femininity." Though artists rarely consented to paint or chisel the extreme hour-glass waists, many artists did take their models from feminine types entirely too exaggerated to be considered as ideals of physical fitness or to be considered beautiful to any other than the voluptuous mind. Other former paintings, especially of the Dutch artists, appear very ludicrous to us now, as their models were distinctly fat.

I dwell upon this point because I have found many women who think themselves underweight and are always stuffing themselves in efforts to overcome their thinness, when as a matter of fact they are eating plenty of food and are fat enough, though they would be improved by a better muscular development.

In the case of men there is rarely any excuse for them to try to fatten themselves. With women we may be somewhat more lenient; although muscular development is always to be preferred to the acquisition of fat, yet some women are so built that they cannot maintain an attractive form wholly from the development

of muscles. For such, at least, during the period of youth, the carrying of a moderate proportion of fatty tissue may be worth in personal satisfaction any injurious effects that might be caused by eating the additional food required to maintain such development. To argue that a woman should be so thin as to be unattractive to all men, in order that she might live longer, is a waste of words—she wouldn't want to live longer.

The most frequent cause of undue thinness or underweight is the lack of sufficient muscles; exercise and not diet must always remain the true remedy for such a lack. But there are cases in both sexes in which there is a lack of both fat and muscle tissue that may have a dietetic origin. In these instances of true undernutrition, the trouble is usually not a question of insufficient eating, but of an impairment of digestion and assimilation through past dietetic errors. The mere effort to increase the food eaten may, indeed, in such cases have quite the opposite effect than that which is desired.

Before giving practical dietetic instructions for those who wish to gain weight, I want to call attention to one marked distinction between the problem of weight-gaining and the problem of weight reduction. In the case of weight

reduction, dieting is a positive and infallible method; if one eats less of the fuel or fat forming foods than the daily functions of the body require, loss of weight *must* result. But in the contrary case the eating of more food will not always result in an increase of weight. Moreover, while the loss of weight, for those who are too heavy, almost invariably results in physical benefit, the increase of weight on the part of those who are undeveloped will not be of benefit unless the increase is largely in the form of useful active tissue rather than mere fat.

True under-nutrition may be caused either by lack of sufficient food, a lack of properly proportioned and balanced food, or, a lack of ability properly to assimilate food eaten. In any case the first thing to do is to see that the diet contains all the necessary food ingredients and contains them in approximately the correct proportions. A diet so selected will usually remedy the trouble without any particular effort to eat a larger quantity than natural hunger calls for. Such a diet combined with the general program of hygienic living will remedy all ordinary cases of under-weight.

In particular instances where the digestion has been impaired, special diets will be needed to overcome such impairment. For this purpose

there is no diet more worthy of a trial than the milk diet. Milk is one of the most digestible of our foods and unquestionably supplies nourishment in a very efficient form for the production of either muscular or fatty tissue. The milk diet has given splendid results in thousands of cases of under-weight and malnutrition. Such gains, however, may prove to be of a temporary nature, if the temporary milk diet is not followed by a permanent régime that includes both proper food and sufficient exercise.

One should not attempt to gain weight too rapidly, as the human being cannot be fattened like a pig, without producing an utterly worthless form of tissue. If too great an amount of food is eaten the results will be quite opposite from weight gaining. Such deliberate over-eating was tested by English scientists; they prescribed for several subjects a diet of about 4,500 calories, and the subjects agreed to eat it and see what happened. They were healthy men, taking moderate exercise. For a few days they laid on fat rapidly. Then, in every case, the appetite failed and they had to force themselves to eat at all. They continued, however, until serious indigestion followed by diarrhea put them on the sick list. As a result they lost more

weight than they had gained and were completely "knocked out" for some weeks.

The process of gaining weight should be one of growth, not of fattening, and the human body grows slowly; even in the most rapid growing period of youth, a gain of twenty pounds a year is a large one. The adult whose muscles and tissues have been destroyed by malnutrition or lack of exercise—or which never were developed—can grow new vital tissue the same as youth grows it; but the process is slow, and quicker increases in body weight must necessarily be of fat only which is not so desirable nor in many cases so easy to retain.

As evidence how little food is required beyond the body's daily consuming needs, in order to gain weight, we have only to figure out that if the nutrients of an extra glass of milk or two eggs a day were retained in the body, it would mean a gain of about five pounds a month or sixty pounds a year.

The following sample menus are of the type to use for the increase of weight. You should be able to make other menus of this sort from the general knowledge you have acquired from this book. It is assumed that in all weight gaining programs proper exercise for muscular development is to be taken.

GAINING MENUS

Breakfast

Sweet Fruits, soaked or steamed with cream and sugar
A dish of boiled Wheat
Two glasses of Milk

Lunch

Two Eggs
Whole Wheat Bread and Butter
Any stewed vegetables, dressed with Milk and Butter
Stewed Figs, or Cornmeal, or Farina Pudding

Dinner

A rich Soup
Bacon and Baked Onion and Potatoes
Salad with Oil dressing and Ripe Olives
Ice Cream, or Bread Pudding

Breakfast

Bananas and Cream
Graham Gems and Butter
Two glasses of Milk

Lunch

A Salmon Salad
Whole Wheat Bread and Butter
A glass of Milk, boiled, or sweetened with Honey
A Fruit Pudding
Two cups Cocoa

Dinner

A full Cream Soup with Butter added
Whole Wheat Bread and Butter
Cottage Cheese with Honey
Nuts and Raisins

As is noted three meals are suggested though many people will gain more on two than on three meals. It is not so much the quantity you eat as it is the amount that is eaten with a keen appetite. Also remember the necessity of partaking quite freely of liquids, especially at meal time. This suggestion does not include

ice water. Hot drinks are usually preferable, though strong tea or coffee should be tabooed. Though not fattening, buttermilk can be used at each meal as a drink for a stomach tonic if it is appetizing.

CHAPTER XV

Eating to Reduce Weight

THROUGHOUT this book I have given numerous arguments against over-eating and the condition of obesity which usually follows.

But perhaps the most convincing argument of all is that the fat man or woman is unsightly of appearance and very obviously handicapped in social life as well as in the more serious business of muscular or mental activity. Fat is no longer in fashion, and even a degree of fatness formerly thought to be a sign of good health is now known to be a sign of ill health and a prognostication of an untimely death.

Most convincing of these very real handicaps of the fat man in the race of life are the investigations made a few years ago by the insurance companies of America. Hundreds of thousands of cases were tabulated in which the weights and heights of the policy holders were known. From the records of all policy holders the average weights for the various heights and ages were determined. All records were then

assorted according to the percentage of individual departure above or below these standard or average weight figures. The number of deaths in each such group were known and by comparing the number of deaths that actually did occur with the death rate to be expected from all individuals of similar ages, it was possible to derive figures that show the practical effect of various degrees of over and under weight upon the death rate.

The description of this method of investigation may seem a little confusing to the reader, but he can rest assured that the life insurance statisticians knew what they were about. Their companies pay out millions of dollars on policies and if they make a mistake of insuring the wrong kind of men, or of insuring them at too low a rate the companies will suffer a heavy financial loss. There was money back of this effort to find the truth concerning the effect of the weight upon the proper length of life; and the truth, when found, surprised even the insurance experts.

They found that over-weight, even in a mild degree very materially increased the death rate; they also found that the greater the over-weight the greater the increase in death rate. No statistics were gathered for extreme cases, as these

would be too few in number to draw a general conclusion, but they found that men ranging from sixty-five to eighty-five pounds overweight (which in a man of average height would be about 225 pounds) had, at some age periods, a death rate practically twice as great as men of normal weight.

The increase in death rate or the danger from obesity was discovered to vary in degree according to age; obesity is not nearly so dangerous in youth, and not quite so dangerous in old age, as it is in middle life. But at all ages extreme obesity increased the death rate.

On the other hand it was found that underweight is most dangerous in youth; as men grow older being under the average weight is found to be an actual advantage and results in a decreased death rate. Obviously the reason for this is that the average figures for the weights of all men which were taken as a standard in this investigation do not constitute a true or an ideal standard. By a study of these figures (too complicated to give here in detail) we learn that young men, on the average, weigh less than they should, and that older men, on the average, weigh more than they should. The logical explanation is that young men are not so often too fat but have frequently undeveloped muscles,

whereas the great majority of old men, whatever be their muscular development, are too fat.

Youth is a period of activity, the period in which growth and muscular development should occur. As men grow older they are naturally less active and some shrinkage in muscular development is not incompatible with health and efficiency. Usually what happens is that the muscles are allowed to shrink too much and the diet is not decreased in proportion as it should be. And again obesity invariably results.

Tables of average weight, erroneously called "standard weights" show for both sexes an increase of weight with age. True standard weight tables should show exactly the opposite. The lithe and athletic form of youth is and always will be our ideal of physical form and beauty. To retain it with the passing of years is rather difficult, quite impossible unless youthful activities are kept up. But to camouflage the loss of the muscles of youth by an accumulation of fat is a trick by which we may cheat ourselves and our ignorant neighbors, but we cannot cheat Nature, and she will exact her recompense in the form of inefficiency, ill-health and premature death.

Why then, some may ask, did "Nature" make

it so easy for us to accumulate this burden of fat, only to punish us for sins with which she tempted us? The answer is that primitive man, like other animals, had an uncertain and irregular food supply, it was therefore frequently advantageous to him to eat more than he needed one day in order to carry him over the several days when there might be nothing at all to eat. Civilization has made this crude and inefficient method of food storage unnecessary. On the other hand, civilization has decreased man's need of physical labor which would consume, in a beneficial manner, a larger quantity of food material. Still worse, civilization has compounded thousands of dishes made of over-seasoned and appetite-tempting foods, and so milled and cooked that they may be eaten more quickly and hence in larger quantities than natural food would be.

As a total result of the blunders of man, we find ourselves with a natural temptation to eat more than we immediately need, with the resulting evils greatly increased by our decreased activities and the artificial stimulation of our appetites by unnatural foods.

The remedy is the exercise of both intelligence and will-power. People who are too fat and know that they are too fat—who may even

protest that they do not over-eat—do over-eat and continue to over-eat simply because they like to eat. Such people are always searching for some easy, lazy way to "reduce," without either taking exercise or restricting the diet. They will take any kind of a reducing pill that any charlatan offers them, whether it be made of "bread" or poison. They will go to Turkish baths and sweat out a little water and so tip the scale a pound or two less and go home very happy—only to get their fat back as soon as they have satisfied their thirst. Fat cannot be sweated out nor can it be rubbed off or vanquished by electricity, magnetism, X-rays, or any other form of hocus-pocus.

Fat once deposited in the body can only be got rid of by burning it up, that is, by oxidizing it and breathing it out in the form of carbon-dioxide. There are two ways to achieve this end: one is by increased exercise, and the other is by the decreased consumption of fat-making foods which will cause the body to burn some of its stored fat in lieu of a shortage of fuel material coming directly from the food supply. Either of the above methods of reducing will work alone, but the two of them will work better together. The difficulty with attempts to reduce by exercise without considering the

diet is that the exercise frequently stimulates the appetite; and if that is unrestrained, the results may be merely that the additional food ingredients required by the exercise are supplied by the additional food eaten.

I advise the combination of dieting and exercises in reduction, not because it is the easier method, but because it is the better method. Obese individuals usually accumulate their fat because of lack of exercise and the fatter they become the more unpleasant exercise becomes and the more ungainly they look in the gymnasium or on the tennis court. As a result the fat man, and even to a greater degree the fat woman, is usually under-developed muscularly.

Since additional exercise tends to stimulate the appetite, it might be well to begin your program of exercise first and continue for a few days, before attempting to begin a restricted diet program. In such case you should be careful not to change your eating habits for the worse. As soon as the body has begun to draw upon its stored fat for a fuel supply, and you have become accustomed to resisting the temptation to eat all you want, you may then begin a systematic dietetic program for reduction.

Exercise alone will reduce you, if you do not

increase the food supply, but for those who are very fat, the method is too slow and the amount of exercise required is too great; on the other hand, dieting alone will reduce you very positively and very rapidly, but it will not build up muscular tissue to take the place of the fat that is lost.

The rate of reduction that may be achieved under dieting is not as great as some misleading advertisements would lead us to believe; even under complete fasting, the loss of weight usually ranges from but three-quarters of a pound to one pound a day, although the first three or four days very strenuous exercise will increase this somewhat, but ordinarily the higher figures of reduction are impossible though they may apparently be attained for a few days when one first begins the restricted diet. Such temporary losses of weight are not due to a loss of fat, but only to the decrease of the weight of the food in progress of digestion and perhaps to some loss of water from the body.

The most rapidly effective method of reduction is, of course, a complete fast. Its chief advantage is that it works; whereas many dietetic programs fail to work, merely because one fails, unconsciously perhaps, to adhere to them. When a man goes on a fast he knows positively

whether he is keeping faith with himself or not. Short intervals of fasting, either at the beginning of a course of reduction, or at some later stage, are always effective and often very beneficial, and I do not hesitate to advise them.

The difficulties with the fasting method of reduction are that, from its very nature, it is a temporary makeshift; when one breaks the fast the temptation to eat all one can is very great, and fat can be put back almost as rapidly as it can be taken off. Moreover, in the case of those who are very much over-weight, the body can be starved for non-fat elements before the fat can be taken off by fasting. The danger of this would, of course, be increased if the previous diet had been deficient in non-fat food essentials; which is very frequently the case. Long fasts as scientific experiments are very interesting and instructive. Under skilled guidance long fasts also have very great value as a curative agency.

The quickest safe way to reduce is to limit the diet to those foods needed to supply the vitamines, the minerals and a sufficient though not excessive quantity of the high efficiency proteins. Such a diet, if selected from natural foods, will not be wholly lacking in food elements from which fat can be made; hence any

diet, if eaten in excessive quantities, will fail as a reducing diet.

The ideal method of weight reduction is to select a diet in which fat forming elements are less than the usual proportions for maintaining a normal weight—and to eat of such foods in quantities strictly limited to the amount necessary to supply the non-fat elements. Upon such régimes, a number of which will be given in this chapter, it is possible to lose from one-fourth to one-half pound a day; and no matter what the weight to begin with, one can keep up such a diet until a truly ideal weight has been established. Then with a moderate addition of the fuel foods the essential diet may be continued without any radical break or change which would tempt one to go back to his former eating habits.

In planning the diet for reduction there are a few other points that should be noted. It is desirable that the restrictions be made in a form that will cause the least privation from hunger and offer the least temptation to over-eating. The use of foods of a bulky nature will aid in this matter both because the mind will not note the seeming scarcity of food so readily, nor will the digestive tract feel so empty; hence bulky vegetables and pulpy or juicy fruits

should constitute a large proportion of the reducing diet. Their use in such case is also quite in harmony with our desire to supply ample quantities of vitamines and minerals, and to promote a vigorous intestinal action, thus preventing constipation, which might otherwise occur from a decrease in the accustomed quantity of food.

A second consideration is that foods should be used that require mastication, and that pains should be taken to eat slowly and masticate all foods. A given quantity of food which requires thirty minutes to eat will be much more satisfying and more thoroughly appease hunger than if the same quantity of food were disposed of in five or ten minutes.

A third consideration is that one should not eat too often—or at least one should not sit down to a full spread meal too often. This may be purely a matter of habit, but it is rather difficult for most of us to "quit in the middle of a meal." It is much easier to skip the meal entirely. As a general thing I should advise the adoption of the two-meal a day plan for all those who are over-weight. A still better plan during active reduction would be to have only one regular meal, by which I mean a meal with a variety of courses. The other "meal" or

meals as it may be in this case should consist of one or two definite items, such as, a glass of milk, an orange or a salad, when it is no temptation at all to over-eat because no general meal is set before one.

You will frequently meet with so-called reducing diets, in which the essential advice given is to refrain from certain particular foods. The publication of such half scientific matter has been to convey the notion that certain foods are "fattening." Among those that have fallen under the taboo are potatoes, sugar and, of course, fat meat, pastries and confections. These foods are no more fattening than scores of others that might be mentioned. Eliminating them from the diet will be effective only in case they have been eaten to excess in the past, and one eliminates then without putting other equally fattening foods in their places. There is no necessity for strictly avoiding any one food in a reducing program. Particularly in the case of potatoes, a comparatively innocent food has suffered a most unfair reputation, and merely because so many people eat potatoes in wholly uncalled-for quantities. Most of these so-called fattening foods are eaten in excess, and the quantity should be reduced or the food entirely eliminated. Where the practical

joke comes from such notions is that the fat man most religiously abstains from the tabooed food and then wonders why he does not get thin, and perhaps concludes that all dietetic writers are fakers. I have seen men whose waists were bigger than their chests very carefully put a saccharine pill into their coffee, to avoid a teaspoonful of sugar, or perhaps refuse a potato in the manner of a Methodist preacher from Kansas rejecting a Scotch highball—and then consume a meal that would have foundered a champion pugilist.

Some typical weight-reducing menus:

REDUCING MENUS

Breakfast	*Breakfast*
Cereal Coffee	Shredded Wheat with berries
Soft Boiled Egg	Glass of Buttermilk or a hot drink
A slice of Whole Wheat Toast	
Lunch	*Lunch*
Glass of Buttermilk	Baked Potatoes without Butter
A Green Salad	A piece of Broiled Fish or Young Chicken
Stewed Carrots or Onions	A Green Salad
Dinner	*Dinner*
Chipped Creamed Beef	Clear Vegetable Soup
Bran or Corn Muffins	A large dish of Greens flavored with Lemon Juice or a salad dressing
Tomatoes, sliced or stewed	Ham or Dried Beef
Dessert	A Fruit Juice drink

Breakfast

An Orange

Lunch

Glass of Buttermilk
Lettuce, Tomato Salad with Cottage Cheese Dressing without Oil
A few hard Crackers

Dinner

Vegetable Soup
Bran Muffins
Asparagus or String Beans
A few Nut Meats eaten with Celery
Fruit Sherbet or Punch (not sweet)

Breakfast

A few soaked Prunes or
A glass of Buttermilk

Lunch

Plenty of Spinach with one Egg
Glass of Milk
Apple Sauce with slice of Whole Wheat Bread

Dinner

Oyster Soup without Butter
Celery or
Graham Muffins
A Baked Potato with Salt
A few Nuts eaten with two or three Figs
Grape Juice

CHAPTER XVI

Food and the Sexual Life

EITHER considered as a social problem, or as an individual and personal problem, the sexual life is vitally important in its relation to health, happiness, morality, and racial welfare. Any light that can be shed on this subject by science or practical human observation should be welcomed as ranking with the most important knowledge that man can acquire.

My own attitude favors the open and frank discussion of sexual problems, and my opposition to all prudery that would shield vice and disease by a veil of ignorance is too well known to require any apology here for the discussion of the effect of food upon the sexual life.

Many years ago I learned that over-eating and the use of stimulating foods led to an unnatural increase of the sexual passion of man, and hence were instrumental in the increase of vice and disease. I further learned that the use of a natural vegetarian diet and the elimination of meat, together with a general reduction of the quantity of food eaten, were very valuable aids

in controlling the sexual passions, and enabling men to lead clean, moral lives.

Although this knowledge has long been a part of the general program of clean and healthful living, which I have advocated and taught, no account of investigation of this problem by systematic scientific experiment had been reported until the result of the war-time investigations of a restricted diet were published.

The problem of the effect of food on the sexual life was not one of those Dr. Benedict and his associates started out to investigate, but the facts in this connection that came to light as a result of their experiments are exceedingly interesting and important.

The men in this experiment were taking courses of training for work as Y. M. C. A. Secretaries or Physical Directors. Both groups were well educated in sexual matters and were mature men living clean, normal lives and with a wholesome and intelligent attitude toward sex matters. Therefore, the evidence given by them is much more valuable than that which could be secured from an ordinary group of men, who would have been prudish and ashamed to reveal any evidence in regard to their sexual desires.

On the other hand, it should be noted that the

scientists having this experiment in charge had not thought of this phase of the problem and, therefore, nothing had been said regarding it to the men, which might have prejudiced their observations. The matter came to their attention quite by chance from one of the subjects who volunteered a statement that the effect of the restricted diet had been to eliminate all sexual desire. Therefore, the scientists in charge, without previously discussing the matter with the men, secured by private and individual interviews statements regarding the effect of the low diet upon their sexual natures.

The agreement of the reports of these men was astonishingly uniform upon this subject. All of the twelve men reported a general decrease of sex interests.

Upon the reports regarding the more specific physical expressions, the majority gave quite definite proof of less tendency to uncontrolled expression of the sexual nature, as in seminal losses, sexual dreams, etc., as commonly experienced by unmarried men.

Here are a few extracts from the interviews that reveal the general experience of the men:

> "I think there is a relation between the low diet and the sex instinct. . . . This winter I made on an average two visits a week to my fiancée,

Before the experiment when with her I noticed (I hope she did not) much sex stimulation. . . . When visiting my fiancée during the low diet period nothing of a sex nature came to my mind. . . . It has been so long since I had a sex dream that I have no recollection of any."

"I would swear that a low diet greatly reduces sexual feeling. I noticed this myself before talking to any one about it. . . . Jokes and stories which might commonly have a sex appeal were devoid of interest."

"I am very definite in the conviction that there is a reduction in sexual desire during a low diet. . . . I think the kind of food also affects the sex appetite—meat causing a stimulation of it. I do not recall any nocturnal emissions during the diet. Before the diet these were rather frequent. I have usually to put up a stiff fight against the sex instinct, and noticed that it was not nearly so difficult to control during the experiment. I slept better—love scenes had less effect upon me."

"The most definite change in sexual matters noticed during the experimental period was that stories and suggestive jokes where the sexual element might have been prominent were repulsive. I was surprised at this."

"I am sure that during the diet period sex desires, particularly as associated with dances . . . . were decidedly less. At a dance attended during the diet I noticed no sex desire or irritation, which was quite unusual for me and impressed on me that there was a change of some sort."

All of these data back up in a most convincing manner the principle that I have long

believed and taught. The sexual life of man is unquestionably directly influenced by his eating habits. Sexuality can be unduly stimulated by excessive eating and can be diminished by abstemious eating.

Since the first edition of this book was published considerable evidence has come to light that indicates a somewhat different explanation of why these men lost their sexual inclinations on these low rations. The earlier explanation was that it was merely the lessened quantities of total foods, but we now have cause to believe that it was rather the decreased quantities of certain food elements.

These men were on a conventional diet. They reduced the amount of food eaten one-half, and it follows as a matter of plain arithmetic that they cut down the amount of every food element in that diet as well as the amount of total calories. If so, and we assume that sexual virility is due not to total food but to certain food elements, and that these are none too plentifully supplied in the conventional diet, then it is quite possible that on the reduced rations these men got less of the quantities of the particular food elements that stimulate the activity of the sex glands.

On this theory we see the possibility that sexuality could be maintained on even a low calorie

diet, if we knew just what foods to use. This is important, since such knowledge would permit of the control of the sex function in both ways—checking it when in excess and stimulating it when in decay.

Unfortunately, the knowledge is not at hand that enables us to prescribe accurately in this important matter. The claims made for the discovery of a sex fertility vitamin have not been sufficiently established at this writing to make possible any certain application. The discoverers first noted this vitamin in lettuce. They claim also to have found it in beef, and not to have found it in yeast. On the other hand, a report comes from London that the lions in the Zoo were not able to breed on a diet of beef, but were able to do so when yeast was added.

These seeming contradictions may be correctly reported, for it may take several food elements working together to make fertility possible. This is indeed quite logical, since conception of life requires all of the elements of life—for the creation of a complete living being, even though of minute proportions. If many elements in addition to ordinary fuel and protein foods were necessary for sexual fertility and any one was missing, then fertility would fail. Thus the lions on their muscle meat might have lacked an

element supplied by yeast, and the rats that failed to produce on yeast might have lacked elements that were in the meat and hence not otherwise supplied from some other source.

Some observers have reported that animals could not breed on a milk diet, fine though it is for growth. Others have contradicted this statement. Both may be correct; it may rest on whether the cow that gave the milk had been fed on grass, or on dry grain feed.

All this is highly interesting but much further research must come before definite application can be given. It would seem probably, however, that a diet of several types of foods known to be rich in growth and vital elements would prove to be capable of giving fertility, or of giving it with lesser food quantities than a denatured type of diet. Milk, eggs, cod liver oil, green leaves, whole grains, yeast and perhaps fish roe and such organs as liver and brains would be likely to yield the elements of fertility in lesser quantities of total food than would a conventional diet.

Indeed, the half rations that abated sexuality in the Carnegie experiment should be tried again with various high vitality diets.

I would further call attention to the fact that sexuality as revealed by the presence of sexual passion is not necessarily synonymous with fer-

tility or the power of procreation. Indeed, the sexual passion is sometimes present in excess in individuals that are sterile.

It is my belief that overeating stimulates sexual passion unduly, and that this is due to the creation of a congested and surfeited condition that is entirely unnatural and unwholesome. I further believe that many men have a more or less vague realization of this fact and that their indulgence of a gluttonous nature is parallel to their sexual indulgences, if one is not actually caused by the other. Even if no moral consideration were involved, it is a fool's paradise and is short-lived, for such ways of living burn themselves out and kill the goose that lays the gilded egg of sensuous pleasure.

As will be clearly shown in the last chapter, the effect of over-eating is to cause man to live his life at a higher pressure and hence shorten his years. We have good cause to believe, both from the standpoint of scientific reasoning and from practical observation, that what is true of life in general is true of sexual life. It is a case of a "fast life and a merry one" or "eat, drink and be merry, for tomorrow we die."

There is nothing in our knowledge of nutrition to indicate that the stimulation of sexuality from gluttony is necessary to preserve the powers of

procreation for legitimate use. Quite the contrary is true, and while there may be a point of underfeeding or deficient feeding below which sexual powers would fail, the best chance of their preservation is from temperate living on moderate quantities of natural and high vitality foods.

CHAPTER XVII

Feeding the Baby

THE best food for the baby is mother's milk. There may be a few exceptions. There are occasionally instances where the mother does not furnish sufficient milk and then there are some instances when the milk does not properly nourish the baby. But the breast-fed baby usually has more vitality than those fed with the bottle.

The protein of the mother's milk as well as its other food ingredients is superior for the nourishment of the child to any foods derived from other sources. In spite of all the development of the science of infant feeding by the modification of cow's milk the fact remains that breast-nourished babies always are and probably always will be the best nourished.

Civilized woman's failure to nourish her child, whether this be a matter of her own decision, or necessitated by the artificial condition of her life, is one of the crimes of civilization. Pages of statistics might be quoted as to the greater

death rates and inferior health and growth of the artificially nourished baby. Happily, however, for the mother who cannot nourish her child, it should be stated that the chief loss of child life through artificial feeding is due to carelessness and ignorance. And while natural nursing is always preferable, artificial feeding can be made fairly safe and efficient.

If the Mother cannot nourish the baby, the next best food is cow's milk or goat's milk.

The high mortality record which prevails among infants is due largely to the mistakes made by mothers who are unable to feed their children by natural methods, that is, from the breast. There are all sorts of formulas advocated for feeding bottle babies. Although many of them may be of value, in the end, one usually learns, as the result of experience, that the simple combination of cow's milk, sugar of milk and the juice of an orange will form a basis for a baby's diet which cannot be improved upon. There may be occasional instances where lime water may be essential, though as a rule when the proper quantity of orange juice is furnished the lime water is not needed.

The use of cow's milk, as stated, can be continued without any other additions than those mentioned, until a baby's mouth is literally full

of teeth. Then, of course, it is ready for solid food.

Very hard bread, like zwieback or food of this nature can be used occasionally to encourage the inclination of the infant to chew and also may help in the teeth-cutting process. As outlined in the table which will follow, when an infant is very young the quantity of cream must be greatly increased. In fact when it is a few days old the food should consist largely of cream, diluted with water and with sugar of milk as stated. As it grows older the quantity of cream can be gradually decreased until the full cow's milk is being used. The exact time when this change should be made will depend largely upon the vitality of the infant. Usually the sooner it can be made the more advantageous it will be to the baby.

It is quite frequent in infant feeding to neglect to give a sufficient quantity of water of the proper sort. Pure water is absolutely essential. Distilled water is usually best, though boiled water which has been aerated is satisfactory.

And please remember that the best distillation process is furnished by nature in the rain that falls from the clouds. Naturally in the city, this rain is usually quite dirty, but rain which has been taken from a clean roof and

stored away in a clean vault not only makes a perfect drinking water but is the most satisfactory water for a baby. If your roof in the country is allowed first of all thoroughly to cleanse itself with the beginning of a rain, the rain that falls thereafter can be enclosed in a clean vault and this sort of water for human use cannot be improved upon.

When water is first given to a baby (use a bottle) it is usually desirable to sweeten it with sugar of milk. This encourages the child to begin taking the water, and the sugar of milk can be gradually lessened, unless you are feeding the child with cow's milk, and in that case a certain amount of sugar of milk is essential thoroughly to nourish the child.

As soon as an infant secures sufficient digestive power to be thoroughly nourished, it is usually better gradually to change its feeding to full cow's milk, one feeding to be given every three or four hours, though water should be given half way in between feedings, sweetened with sugar of milk.

As showing the tremendous importance of water for an infant, I remember prescribing on one occasion for a baby that was little more than a skeleton. It was about eight months old and weighed a little over seven pounds. After mak-

ing careful inquiries as to the methods which had been used in feeding the infant I concluded that they were not giving it sufficient water. It was actually "drying up" for the need of water. I prescribed from six to eight ounces of cow's milk every three or four hours and the same quantity of water sweetened with sugar of milk, half way between each feeding.

As a result of this change in its feeding habits, the infant almost immediately began to gain a pound a week and continued gaining until it had acquired normal weight.

Perhaps the greatest of all mistakes that are made in the feeding of infants is the inclination of the average mother to over-feed. Whenever a child fails to gain proper vitality, every inducement is made to increase the amount of food taken. This tendency, itself, in many cases is the actual cause of serious diseases. Over-feeding tends to bring about digestive defects and interferes materially with proper assimilation. What the child really needs is a digestive rest and while it is taking this rest it can be given water freely, but milk should be avoided altogether. This can be continued from one to three days with perfect safety. In fact, where necessary, this fasting régime can safely be continued even beyond this period.

The average mother is, of course, afraid to fast her infant even for a day, but in many cases this is really the only means to bring about a change for the better. I have often fasted my own infants from one to three days when but a few months old. Such a fast can be made entirely comfortable by giving the infant water sweetened with sugar of milk or with a small amount of strained honey.

When giving water to a baby it should always be given in a bottle the same as the milk. If the baby is given sweetened water, as stated above, it will not notice the fast. It will be about as comfortable as when feeding; in fact, in many instances more comfortable when it needs a fasting régime of this sort.

In the case of bottle-fed babies, mothers often make the mistake of using nipples that allow the baby to secure the milk too quickly. Usually the slower the milk is taken the more readily it is digested, and the more benefit the infant secures from it. It is possible to use an opening in a nipple that is too small, but if the child takes about ten minutes for each feeding it is far better than if the milk is gulped down.

Be sure to avoid feeding too soon after a physical disorder of any kind. Wait for the

child's appetite to assert itself. It is usually safer to begin with water, sweetened as stated, than it is with milk or other foods. As already stated, orange juice or the juice of some other fresh fruits should always be used if the baby is not breast-fed and in fact, even breast-fed babies can sometimes be benefited by its use. Don't use bottled juices or juices from canned fruits. In fact, orange juice is usually much safer than other fruit juices. From half to a whole orange is usually sufficient. If it is given to the baby in spoonfuls at different times of the day, it is usually more advantageous than if given at one feeding. As a rule a child craves this acid fruit juice, indicating the need in the system for the elements that it contains.

The tables which follow herewith should be taken merely as a suggestion. The quantity of the food depends largely upon the size of the infant, its vitality, etc. As a rule the safest way is to feed an infant as long as it takes the milk hungrily, that is, is eager for it. You can then usually be assured that it is not taking too much. But when it begins to play with its food or turns away from it the meal should end there. Furthermore, food that is taken eagerly is digested far better. The stomach is then ready to take care of it and all the organs

are in a condition properly to perform their functions.

In fact, this is an excellent guide for a mother as to when a child will need a fast: when it begins to "go off" its appetite. Then, as a rule, it is a good plan to drop one or two feedings and give it a chance to get its appetite back. If you fail to do this and continue to force food upon it and encourage it in other ways to take food, you are treading on dangerous ground. It is under circumstances of this nature that a baby contracts illnesses of various kinds. In nearly every serious illness, you will first of all notice the baby begins to turn aside from its food. This increases until it refuses nourishment altogether. If you will refuse nourishment when it first begins to turn aside from food, you will, in a great many cases, divert dangerous illnesses.

You will note in the table on page 238 that we suggest that whole milk be given from three to four months and thereafter. It can, in some cases, be given before this and in some instances this is too soon to use whole milk but, as previously stated, the sooner you can begin to use whole milk with water in between milk feeding, the faster the child will gain in health and strength. Begin the water feedings very

early in the child's life. Always feed water from a bottle, though when an infant is very young and is breast-fed a spoonful of water now and then is often of great value.

When a child is crying, in many instances a little warm water given with a spoon will bring about a feeling of comfort that will quickly induce sleep. Crying of an infant in every case indicates discomfort of some sort, and mothers who have frequent trouble with their infants during the night have only themselves to blame. A child that is properly fed and properly cared for in every way rarely cries, especially at night.

As soon as possible, the habit of feeding the infant all through the night should be discontinued. The last feeding should be about nine or ten o'clock when the mother retires, and the next feeding very early in the morning. One can break an infant into habits of this nature as early as two months and in some cases earlier. Naturally as long as you continue feeding during the night, the stomach will demand it and the baby will cry for it.

When you come to the time that you want to discontinue night feedings, if, instead of milk, you simply give water, the stomach will soon cease its nocturnal demands.

In making this change, it is often necessary to allow the child to cry itself to sleep one or two nights when it wakes for its regular feeding, though, as a rule, this is all the inconvenience associated therewith.

TABLE FOR BOTTLE FEEDING OF AVERAGE INFANT

AGE	TOP-MILK	MILK SUGAR	LIME WATER IF NEEDED	BOILED OR DISTILLED WATER	AMOUNT OF EACH FEEDING
	OZ.	OZ.	OZ.	OZ.	OZ.
Up to 1 month	5	1	1	15	1½ to 2
1 to 2 months	7	1	1	15	2 to 3
2 to 3 months	10	1	1	15	3 to 4
	(WHOLE MILK)				
3 to 4 months	15	1	1	15	4 to 5
4 to 6 months	20	1	1	15	5 to 6½
7 to 10 months	25	1	1	10	7 to 8
10 months and upward	32 (1 Quart)	1	1	8	8 to 10

Water can be aerated by pouring from one pitcher to another or from one vessel to another. Water is more perfectly aereated by nature when it falls as rain. Boiled water should especially be aereated before it is fed to the infant. Otherwise it will taste dead and flat.

You will note our reference to the top milk. We mean that from a quart bottle on which the cream has been allowed to rise you should

pour the quantity stated. You will note that when the infant is from three to four months old we have indicated the use of whole milk. This, however, should be only tried as an experiment at this age. If the child thrives with the change then continue it, or if the diet is not satisfactory, increase the amount of cream slightly. I have seen whole milk taken by an infant as early as two months of age with satisfactory results.

When orange juice is used and it is of satisfactory quality, in many instances lime water is not needed. If the child does not seem to digest the milk, that is, it "throws it back" then the value of lime water should be tested. If the child seems to thrive better with the lime water even when orange juice is used, it is desirable of course that you continue its use.

CHAPTER XVIII

The Feeding of Children

THE principles of the correct feeding of children are in some ways quite different from the laws of feeding the adult. These distinctions are based chiefly on the fact that the children grow while adults do not.

This fact of growth is exceedingly important and must in no wise be overlooked. It is a general law of life that the primary business of the young creature is to grow. In some species the growing period is distinctly marked off from the period of maturity. In bees, for instance, the young larvæ is fed on "bee-bread" made from the pollen of the flowers, and rich in protein. When the larvæ of the bee goes through the transformation stage and comes out as an adult insect, it ceases entirely to eat its former food; in fact, it is incapable of doing so. The adult bee lives on honey, which is almost wholly a fuel food. In the case of some insects whose adult life is briefer, no food whatever is taken in the adult period.

In the higher animals no such sharp distinc-

tion marks off the period of growth from that of maturity, but to a certain extent the nutritional laws which more sharply divide these periods in insect life apply to the higher species.

In addition to the growth factor there are certain other differences between childhood and maturity; the body of a child, being smaller, the heat lost by radiation of the surface is greater in proportion to the weight of the body. The pulse in childhood is more rapid and the speed of the general physiological activities is greater. These facts, together with the fact of growth, necessitate that the child consume more food in proportion to its weight than the adult—in fact—this rate of food consumption according to weight is for a young child three times as great as the adult's.

A further distinction between childhood and maturity, and a distinction that is exaggerated by civilized conditions, is that the child is physically more active—in fact, the normal, healthy child, given proper facilities for play, prefers to be physically active during all its waking hours. But the civilized adult, because of the development in his mental life, the routine of his business, and the restrictions of clothing, housing and customs, ceases this varied activity, and performs his physical toil and even his artificial

play at stated hours and set times. Often he ceases to play altogether, and muscular activity ceases to be essential to his labors. Under these conditions the civilized adult is usually over-fed and under-exercised—hence the main burden of this book, as far as the eating habits of the adult are concerned, is to caution against over-eating and find ways to prevent obesity.

With the child, when normal physical activity is permitted and encouraged, obesity is more rare. Because of the child's activity and its greater food needs, over-eating, while it does occur among children, is not so prevalent as among adults. On the other hand under-eating, which is rare among adults, at least those who are prosperous and have food available, is much more likely to occur among growing children.

Because of their smaller bodies, more physiological activities and greater food needs, children require food more frequently than adults. The conventional three meals a day often represent too frequent eating for the adult, though it is usually ideal for the child. A child should never be allowed to piece between meals, though moderate quantity of acid fruit can with benefit usually be given at any time desired, and his meal program intelligently adapted to his needs.

Children are frequently under-nourished. Among the poorer classes this may be caused by an insufficient quantity of food. But among both poor and prosperous children are frequently under-nourished because of an improper quality of food. As with adults so with children: they may eat plenty and still be under-fed. Moreover, they may be fat and still be under-fed with those elements essential to health, vitality and proper growth.

Most alarming facts have recently been brought to light in regard to this question of the proper nourishment of children. Malnutrition and under-nourishment are the most serious conditions that can affect a growing child, and this crime against childhood is one of the most serious things that can affect human society. For the child it means the stunting of growth, impairment of health and lessened resistance to disease and particularly encourages a predisposition to tuberculosis. In America to-day every seventh child dies before the end of the first year, and two of the remaining six die before reaching maturity—and America is the best fed nation is the world. In some of the poorer districts in our large cities as high as seventy per cent of children are found to be suffering from malnutrition. Not so many were actually

underfed as improperly fed. Even in the most fashionable schools in well-to-do neighborhoods forty per cent of the children have been found suffering from malnutrition, yet all these children had more than enough food placed before them three times a day, but the food was not of the proper quality, or the children did not eat enough because they were pampered, under-exercised or their appetites ruined by improper food indulgence.

Discussing the food problem of the adult we showed that to prescribe the exact amount of food was foolish, and that the proper way to judge how much one should eat was by observation of the weight, or, more accurately, the condition of the body. It is equally foolish to prescribe the exact amount of food for children. With the child as with the adult, the condition of the body is a necessary criterion in determining whether the child is properly nourished or not, but with the child there is one additional factor that should be considered, and that is the rate of growth.

In the case of adults I refrain from giving tables of ideal heights and weights, because I believe that the careful study of the physique is a better method from which to arrive at a proper conception of the weight of the body.

In the case of children I believe that tables will be valuable. Once maturity is reached there should be little change in body weight, but the child constantly growing should be ever changing the body weight; hence the need of knowing what this rate of change should be.

I will first give a table showing the average rate of growth or normal increase of weight in pounds during each year of growth—of course the figures can be computed for shorter time periods.

NORMAL RATE OF GROWTH FOR CHILDREN

	BOYS POUNDS	GIRLS POUNDS
First year	13	13
Second year	5	5
Third year	4½	4½
Fourth year	4	4
Fifth year	4	4
Sixth year	4	4
Seventh year	4	4
Eighth year	4½	4½
Ninth year	5	4½
Tenth year	5½	5
Eleventh year	5½	6
Twelfth year	6	8
Thirteenth year	7	11
Fourteenth year	9	11
Fifteenth year	12	9
Sixteenth year	15	6
Seventeenth year	11	4
Eighteenth year	6	3
Nineteenth year	4	2

The rate of growth is the most important of all factors in determining the nutrition of children. If this increase of weight were always that of vital active tissue no further figures would be needed, but children can get fat and during such fattening periods they would appear to be properly nourished when they were really not growing; likewise, if past accumulations of fat were being lost, children might seem to be ceasing to grow when in reality they were growing all right. Because of these facts it is desirable also to have at hand a table giving both heights and weights in relation to age. For this purpose I am using tables (pages 248 and 249) published in the PHYSICAL CULTURE MAGAZINE and furnished by the New York City Department of Health.

The figures in these tables are average figures determined from the weighing and measuring large groups of children. Some children may, of course, grow more rapidly. The average is rarely the ideal. However, rapidity in the physical growth of a child is not necessarily an advantage. The most highly developed races reach their maturity more slowly than do the inferior races; in fact, one of the greatest distinctions between man and other kindred species is his slower rate of growth. This has come about during the period of man's evolution due

to the development of his greater brain power. The brain grows slowly and the process of acquiring the vast amount of knowledge and experience needed by a civilized man requires time. The reaching of physical maturity before the period of mental maturity is not an advantage, but may prove a serious disadvantage in life. Hence the standard of average rates of growth may be considered as approximately ideal rates; any falling below this standard is a serious matter that should be at once corrected, but there is no occasion for attempting to stimulate growth at an excessive rate as one might do in the feeding of young farm stock.

You have already learned from the discussion of the chemical nature of foods that protein is the material of growth, and that protein foods vary in quality, those from milk and eggs being the best proteins for human nutrition.

Returning to the subject of the nature of growth foods and the importance of protein in the child's diet, I will call your attention to the fact that it is the quality of protein which needs attention rather than the quantity. Mother's milk is not as rich in protein as the milk of the cow because the young human does not grow as rapidly as the calf. There is no more protein in proportion to other elements

HEIGHT AND WEIGHT TABLE FOR BOYS

The standard or normal weight for a boy is found where the horizontal column opposite his height crosses the vertical column under his age.* Illustration—The standard weight for a boy 57 inches high and 13 years old is 83 pounds.

Height Inches	5 Yrs.	6 Yrs.	7 Yrs.	8 Yrs.	9 Yrs.	10 Yrs.	11 Yrs.	12 Yrs.	13 Yrs.	14 Yrs.	15 Yrs.	16 Yrs.	17 Yrs.	18 Yrs.
39	35													
40	37	38												
41	39	40												
42	41	42												
43	43	44	44											
44	45	45	46											
45		47	47	48										
46		49	50	50										
47			51	52	52									
48			53	54	55									
49				55	56	57								
50				58	59	59								
51				60	61	62	62							
52					64	65	65							
53					67	68	68	68						
54					70	71	71	72						
55						74	75	76	76					
56						77	79	79	80					
57							81	82	83	84				
58							84	85	87	88				
59								88	89	91	92			
60								90	92	94	95			
61									97	99	100	101		
62									100	102	104	105		
63									104	106	108	109	110	
64										112	113	115	117	120
65										118	119	121	122	123
66											123	124	125	127
67											125	126	127	131
68											130	131	133	136
69												134	136	139
70												136	140	143
71													142	145

* Note—The age is taken at the nearest birthday.

Only scales with bar and weights should be used. Spring scales with dial face are not very durable and are likely to get out of order soon.

Measurements for height should be taken with the child standing with feet close together and close against the measuring rod, or a measuring tape may be tacked against a wall and a book placed on the child's head, edgewise, to mark his height.

HEIGHT AND WEIGHT TABLE FOR GIRLS

The standard or normal weight for a girl is found where the horizontal column opposite her height crosses the vertical column under her age. Illustration—The standard weight for a girl 50 inches high and 9 years old is 59 pounds.

Height Inches	5 Yrs.	6 Yrs.	7 Yrs.	8 Yrs.	9 Yrs.	10 Yrs.	11 Yrs.	12 Yrs.	13 Yrs.	14 Yrs.	15 Yrs.	16 Yrs.	17 Yrs.	18 Yrs.
39	34													
40	35	37												
41	39	39												
42	41	42	42											
43	43	44	44											
44	45	46	46											
45		47	47	47										
46		48	49	50										
47			50	51	53									
48			52	53	54									
49				55	56	57								
50				57	59	60								
51					61	62	63							
52					65	66	67							
53						68	68	69						
54						70	71	71						
55							72	73	74					
56							76	77	77	79				
57								79	82	85				
58								85	88	93	96			
59									92	95	100	105		
60									97	99	103	107	109	
61									99	102	105	109	111	
62									104	105	107	111	113	116
63										107	110	113	115	117
64											114	117	119	121
65												121	123	125

STANDARDS OF NUTRITION AND GROWTH

The chief standards by which nutrition and growth are estimated are three: 1. The relation of weight to height. 2. The annual gain in weight and height. 3. The general appearance of the child. All school children should be weighed at least every three months—September, December, March and June are the best months. Those who are much below the normal should be weighed at least once every month; better, every week. The height should be taken twice a year, at six months' interval; September and March are the best months, each being the beginning of the periods of most rapid growth. *The relation of weight to height* is the one which is of most value in determining condition. This relation is but little affected by race or country. These tables were prepared by Dr. Thomas D. Wood, of the Child Health Organization.

in the mother's milk than there is in the usual adult human diet, in fact, the proportion is much less than it is in the conventional meat diet.

The most common blunder to be found in writings upon the nutrition of children is this over-emphasis upon the quantity of protein; this frequently leads to the introduction of meat in the child's diet, from which it should either be omitted entirely or used most sparingly. The proper quality and quantity of protein is vital, otherwise no growth can occur, but the unnatural efforts to build the whole diet around protein foods is a grievous mistake.

This blunder of the excessive use of proteins in the child's diet is due to a little knowledge but an incomplete understanding of food science. Much more frequent are the blunders due to utter ignorance; they include not only the over-use of meat, but the over-use of denatured cereal foods, sugar, pastries and, above all, candies and confections. Such dietetic errors result in the food deficiency which I have already discussed at length in other chapters of this book. But in the case of children an insufficient diet is more dangerous because of the necessity of growth, and also because the smaller body and more rapid vital processes of the child render it less capable of storing up the essential food ele-

ments for periods when they are absent from the diet.

The child needs a variety of natural foods; it tires quickly of monotonous and prescribed diets. A child is usually told to eat what is set before him—hence if the child does not like the food set before him he does not eat enough, or makes up the deficiency in quantity by a raid on the jam pots or a trip to the candy store. A child has the right to say something regarding the selection and preparation of his food; many parents will resent this statement, on the ground that the child's ignorance renders him incapable of deciding such a matter. But a parent should remember that a child's appetite is guided largely by instinct which is controlled entirely, if the child be normal, by the needs of its body. Therefore, the child's own appetite should guide the parent as to its needs. The parent should by all means select the child's food and try to train him in his dislikes and likes if his appetite seems abnormal, but the child's instinctive desire should guide in the matter—it should not be forced to eat food that is distasteful. Too often he will go hungry if you insist on his eating food he does not like. One can err either by acceding to the child's acquired taste for a few deficient foods, or by attempting to force

the child to eat foods for which he has no appetite. The problem is one that requires tact and patience as well as intelligence. The solution may usually be found in the use of menus that offer a goodly number of natural and wholesome foods, a sufficient proportion of which the child has learned to eat with relish.

There are a few foods, of course, which are so basically important that they cannot be omitted from the diet. First among these is milk and the simple rule is that every child should have as much as it desires of whole milk; it is his chief dependence for the growth protein, the calcium for bone formation and the protective vitamines, though be sure to remember that milk is not needed with full hearty meals in which a large variety of wholesome food has been furnished. Use milk only with "light" meals, composed preferably of sweet fruits.

The leafy vegetables are not so important to the child as they are to the adult; they should not however be neglected in the child's diet. The practice of giving children well cooked spinach as soon as they are able to masticate it well has been widely adopted and with excellent results in the case of such children being below their normal nutritive condition. The spinach should be steamed rather than cooked since it

loses less mineral salts in steaming. Feeding spinach juice may be begun at the age of one year if the child is not thriving. A tablespoonful a day may be given at this age and the amount may be gradually increased if the child learns to like it. Oranges or other acid fruit should be given daily.

Tender salads with simple dressings should be added to the diet. Cooked greens, especially cooked cabbage, are not so digestible and should come later, though raw cabbage can be especially commended.

Fruit, as well as vegetables should be plentifully used in the child's diet. Prune pulp and apple sauce may be added at quite an early age. As soon as the child has learned to chew his food carefully the sweet fruits, preferably raisins, may be freely given him and should be used to replace the store candies. Nuts which require very thorough mastication, and are not so easy of digestion, should be added to the diet gradually, from the fifth to the tenth year.

The chief reliance for much of the fuel foods for the child must necessarily be the natural cereals, but they should not be used to the exclusion of fruits and vegetables.

In the feeding of children the first thought to keep in mind is the necessity of confining the

meals to three per day. By all means avoid the baneful practice of "piecing" between meals. That is one of the principal causes of children's ailments. The stomach is supposed to have its regular rest and when it starts to digest it should be allowed to continue the process without having additional food introduced in the "middle" of the digestive process.

There is only one exception to this rule, and that refers to acid fruits. Acid fruits like oranges, apples, pears, pineapples, peaches, etc., can be taken at most any time when the child desires them, in moderate quantities. The desire for these fruits, shortly after a meal, frequently indicates the need of additional acid to help digest the meal. Therefore you can safely follow the instincts of a child in its desire for acid fruits, though I cannot emphasize too strongly the necessity of avoiding all other food between meals.

The habit of giving children candies, cakes and delicacies of various kinds between meals should be most strongly condemned. A child cannot possibly maintain health where the "piecing" habit is adhered to unless he possesses extraordinary vital vigor. If parents would definitely understand that by feeding children between meals they are more liable to contract

measles, diphtheria, scarlet fever and many other serious diseases, they will perhaps best realize the danger of eating between meals.

As soon as a child arrives at an age when he depends upon solid food, three meals a day should be sufficient for him and at such meals a child's appetite can usually be depended upon as far as quantity is concerned. A child can be allowed to satisfy its appetite at each of these meals with plain, wholesome food only.

The appetite should not be "tickled" and a child should not be encouraged to eat beyond its appetite. Many parents are inclined to worry if a child seems to lose its appetite. This should cause no concern whatsoever, for if the dictates of the stomach are adhered to, it will come back to its "feed" within a reasonable time.

One of my usual practices, when a child loses its appetite for a few days, is to feed nothing but acid fruit for a day or two. After this, as a rule, a child will keenly enjoy solid foods.

A still better plan in many cases, after a child has seemed to have lost its appetite for a few days, is to put the child on an exclusive milk diet, giving it nothing but whole, sweet milk. In this case, a child should be given milk about every hour during the day and allowed

to take whatever it may desire at this time. If occasionally the period is stretched to one and a half or two hours, this will be satisfactory. In fact, there is no necessity of adhering rigidly to the every hour idea throughout the entire day. The child can be allowed to take as much milk as it may desire under these circumstances, though it should be allowed nothing else except acid fruit in connection therewith. No other food of any kind should be given with this diet.

Many parents are impressed with the idea that a child cannot be thoroughly nourished on milk. This is a serious mistake as milk with no other food will nourish a child indefinitely. In fact, a rest now and then for the stomach from solid food, with a milk diet, is usually valuable to a child, and adults can also be benefited by a similar régime.

I have known many instances where children have been able to gain weight and strength from a milk diet. In fact, in many instances in which a child does not seem to grow satisfactorily, if a milk diet is given for three or four days, about twice a month, there will usually be a very material gain resulting therefrom.

The diets presented herewith are merely suggestions. They can be varied in accordance with the needs.

MENUS

DIET FROM THE TIME THE CHILD IS WEANED UP TO ABOUT TWO YEARS OF AGE

Breakfast

Half or whole orange or some other acid fruit that is enjoyed.

Whenever the bowels are very loose this acid fruit should not be used. When constipated part of the white pulp of an orange, prunes or raisins are advised.

Choice of the following cereals: crumbles, hominy, rice, oatmeal, corn-meal.

The cereal can be served as a drink by making it into a very thin gruel, though it should be made with milk and eaten with a spoon like soup. It can be sweetened with brown sugar, if desired, though honey or raisins make a much more satisfactory sweetening.

Dinner

Choice of any one of the following foods:

Vegetable soup. One egg prepared in any manner, frying excepted. Chopped beef, as in a Salisbury steak, if meat is desired.

With any one of the above foods you can add graham bread, zwieback or whole wheat crackers and baked, boiled or mashed potatoes, with rice.

A dessert can be made of rice, farina, tapioca, custard, etc.

Supper

Corn-meal and milk or some other cereal that might be palatable. If a child is very active and is hungry, one egg can be added.

Whole wheat bread, corn bread or zwieback.

If a child does not seem to be thoroughly nourished on a diet of this kind, a glass of milk could be given before retiring and one hour before each meal, if there is a desire for it.

DIET TWO TO SIX YEARS

Breakfast

Acid fruit as may be desired.

Choice of cereals. Crumbles, shredded wheat, cornflakes, oatmeal, corn-meal, etc.

Dinner

Rich cream soup of some sort, made of vegetables. Beans, peas, barley, etc.

Eggs cooked as desired. Meat, fish or chicken if meat is desired. Chopped beef (top of round steak) is usually the most wholesome and most nourishing kind of meat.

Choice of any vegetable that is especially palatable. Potatoes, carrots, onions, spinach, asparagus, etc.

A dessert can be made of any plain pudding like unpolished rice; custard, blanc-mange or pies can be used made with whole wheat crust.

Candy can be allowed for dessert occasionally or raisins, prunes, dates or any sweet fruit will be more satisfactory.

Supper

Soup if desired.

Eggs prepared in any way that may be appetizing.

Cereal pudding of some sort,—rice, farina, corn-meal, etc., or stewed fruit.

DIET FOR SIX YEARS AND OVER

Breakfast

Raw acid fruits as desired or stewed fruits. Choice of cereals, shredded wheat, crumbles, oatmeal, corn-meal, etc. Served with raisins, dates, figs or other sweet fruit instead of sugar.

Dinner

Any kind of nourishing, appetizing soup.

Eggs prepared in any appetizing manner.

Fish or chicken or meat, if meat is desired.

All vegetables in season.

Salads are especially important in a child's diet as it becomes less active muscularly. Lettuce, tomatoes, cabbage and all sorts of green "stuff" can be made into palatable salads.

Desserts can consist of puddings or pies which can be made with whole wheat crust, or cakes containing a small amount of whole wheat flour or bran.

Stewed fruit or custard.

Supper

Baked apples or other stewed fruit.

Eggs in any form desired.

Vegetables with whole wheat bread and butter.

Milk or cocoa and some light dessert, if desired.

CHAPTER XIX

Eating to Prevent or Cure Disease

DR. WILEY wrote some years ago that the medicine of the future would be foods, not drugs. This prediction has already been partly realized. Many works have been published of recent years on the subject of preventing and curing diseases by dietetic means. The medical profession is slow to give up the use—or perhaps I should say the over-use—of drugs, because their reputed knowledge of the potency of pills is their chief hold on the mind of the fee-paying public. None the less, be it said to their credit, the medical fraternity is rapidly turning its attention to more rational and more natural means of healing, among which the proper diet ranks very high. Particularly is this true of publicly paid physicians employed in various health departments. These men, not dependent on fees and not required to give medicine to people not requiring it, are being rapidly weaned from the medical superstitions of the past, and are becoming advocates of rational [illegible] measures and disease prevention. The

World War undoubtedly had an important influence in turning scientific and medical men toward food problems.

To speak of some of the particular cases, we have the investigations of deficiency diseases, which were discussed in Chapter IV. We find also tuberculosis is now considered to be very largely caused by improper nutrition. Diabetes, long known to be a nutritional disease, has recently been brought under more rational treatment. Formerly doctors were content merely to exclude sugar and starch from the diet of the diabetic, permitting him to eat freely of other foods. Since diabetes is caused by a leakage from the kidneys of sugar from the blood, and since the blood must always contain sugar, or life could not exist, it did little good to exclude sugar from the diet. The method now adopted is that of a fast, followed by a diet carefully restricted as to quantity as well as to quality.

Other illustrations could be cited of the adoption of dietetic methods in the treatment of specific diseases. The subject, however, is too large a one to be gone into in this chapter. I will, therefore, confine my further discussion here to the general relation of food to disease, and to the consideration of a few common ills

or roots of ills, in the prevention and curing of which the general reader may apply the principles of food science, without specific and individual prescriptions.

First, let me say that while food and the condition of the body's nutrition can be shown to be the direct and sole cause of only a few diseases, yet any rational mind must realize that it is an indirect and contributing cause of all diseases. There are very few diseases that are truly epidemic and sweep through a population, afflicting all alike. Those who have the highest vitality and whose bodies are the best nourished, and free from either nutritional deficiencies or excesses, are the least likely to succumb to disease, whatever be its immediate cause. This question of the resistance to disease which varies so widely in individual cases must rest upon the matter of individual physical efficiency. As the general laws of health, including those of nutrition, become fully understood and universally applied, diseases will disappear and disease germs will die a natural death. Those who follow the general dietetic laws taught in this book will decrease their susceptibility to disease to well nigh the vanishing point.

The diseases which are both common and which are most directly connected with food

problems, and are most certainly prevented or cured by correct eating, are as follows: First: Digestive disorders. Second: Diseases associated with under-weight and under-nutrition—tuberculosis comes in this class as do many nervous afflictions. Third: Diseases associated with over-eating and obesity. This group includes diabetes, cirrhosis of the liver—and for that matter practically all diseases connected with the kidneys and liver. Apoplexy, gout and many forms of heart disease are also associated with obesity, and are presumably caused by the over-eating which causes the obesity.

Obviously the way to prevent diseases, or to cure them if they already exist, when the diseases are caused by or associated with malnutrition or obesity, is to avoid or cure the malnutrition or obesity. In other words if the body weight is made right and kept right, the disease cannot appear, or if the correction is not made too late, will disappear.

In the more immediate matter of digestive disorders, the correction of the diet as the means of relief is too obvious to need argument. There are thousands of tons of drugs taken to cure stomach troubles, while the cause which is the use of indigestible foods or excessive food quantities, fails to be corrected. The one sure cure

for indigestion is to quit eating. This may sound like a humorous statement; nevertheless it should be taken seriously. When a man breaks down from over-work, he obviously needs a rest. The same is true of the over-worked stomach. A man dependent on work for his livelihood cannot rest too long without being in danger of starvation, and so also, the stomach cannot take an indefinite rest without the same effect upon its owner. But the overworked stomach can be given a brief rest (from one to seven days) and this is frequently all that is needed to effect a cure.

All stomachs do not get out of order from the same causes; the excessive use of certain foods, or certain badly prepared foods or bad food combinations may be the cause of the particular trouble. It is up to the intelligence of the individual, with or without professional advice, to find the trouble and eliminate the cause. No general rules can be given here that will apply in all cases, other than the general rules for proper eating as are given elsewhere in this book. These general rules, however, will eliminate nine-tenths of digestive disorders, because nine-tenths, yes, ninety-nine per cent are caused by dietetic errors. These errors are associated with over-eating and the use of over-

seasoned, over-complicated and over-cooked foods. Hence the general remedy is to return to a natural diet. In case of digestive disorder such a natural diet is rarely more imperative than for those whose digestive apparatus has stood up under the strain and can handle anything offered, passing the trouble on to the liver, kidneys, heart and nerves.

The use of very simple diets often work wonders with chronic cases of indigestion. The milk diet is one such simple procedure, and it is well worth trying for those who suffer from stomach trouble, especially when this trouble is associated with under-weight, loss of sleep and a general case of "nerves." Another form of diet, often of high curative value, is one consisting almost wholly of uncooked foods. This does not mean that one should eat raw meat, or raw pie-dough, but that one should omit all such foods as seem to need cooking, and confine the diet to the milk group, nuts, fruits and tender vegetables, that may be and should be eaten uncooked.

Another disease, and one that has been called the mother of diseases, is constipation. This disorder, with which the majority of civilized people are afflicted, is usually caused by wrong eating. Taking drugs for this, while continu-

ing the eating habits that cause it, is a stupid and a dangerous procedure which offers no permanent relief. The proper regulation of the bowel action is a matter which every individual should attend to as he does to the matter of external bodily cleanliness, and of these two affairs of personal hygiene the former is of the greater importance. Dirt upon the skin is unsightly but it is rarely poisonous; a congested intestine is a constant source of body poisoning.

The rate of the passage of the food and food residues through the alimentary canal depends on the bulk or quantity of indigestible fibre. Each species of animal has a digestive tract of a size fitted to deal with the natural food of the species. The herbivorous animals have voluminous digestive organs; the carnivorous animals have relatively small intestines. Man ranks midway between these two groups, as his natural diet is of less bulk and contains less fibre than does that of the cow, but more than that of the lion. When the food quantity is restricted, because of man's lessened activity through civilization, and all fibre is eliminated from the diet, the result is that the intestines have not a sufficient bulk of material to deal with, and the food waste does not pass from the body with sufficient promptness. The result is that the waste,

together with poisonous products of decay and fermentation, is reabsorbed.

Various artificial means have been resorted to to overcome this difficulty. The worst and the most commonly used is the purgative or laxative drug. Such drugs, no matter how much they are camouflaged with "candy" or advertised as harmless, are poisons which irritate the intestines, thus bringing about an artificial diarrhea in a natural effort to eliminate them. The remedy may be quite as bad as the disease, and never effects a real cure.

The natural laxative is, of course, the cellulose fibre of natural foods; two other substances are now used as substitutes which depend upon their mechanical and not their chemical action. One of these is Agar, which is a gelatinous form of cellulose made from seaweed; the other is mineral oil which is wholly insoluble and has no chemical action but merely acts as a mechanical lubricant. These materials, though bought in drug stores, are not "drugs," but merely artificial substitutes for the natural cellulose of food and therefore do little or no harm, and often much good may come from their use, though one should strive at all times to follow a diet that will insure regular bowel activity.

Another remedy for constipation is the in-

ternal bath or injection of water into the colon; this is an immediately effective remedy and should be used when there is need of immediate relief. It should not be necessary, however, as a permanent habit, but may be used in emergencies and while one is bringing about a permanent relief and restoring normal intestinal action by the proper diet.

A sufficient quantity of bulky fibre in the food is the ideal and only permanent method of establishing and maintaining proper intestinal action; the proportion of such fibre needed will vary somewhat with the individual, and his past eating habits, as well as with his general muscular vigor and physical activity. The substitution of "live" vital food, such as whole wheat bread instead of white-flour bread is frequently all that is needed to obtain permanent relief. The use of leafy or fibrous vegetable and pulpy or fibrous fruits is equally valuable if they are used in sufficient quantities; prunes and raisins are both excellent. Oranges with the yellow covering rubbed or peeled off, leaving the white substances, can often be used to great advantage. Eat white part of peeling with the pulp of the oranges before breakfast in the morning.

CHAPTER XX

The Diet in Old Age

THE average man does not concern himself with the question of how long he is to live until he begins to grow old. I, therefore, have entitled this chapter "The Diet in Old Age"; but it might better be called "the diet to prevent old age," or "the diet to increase the length of life."

There is really little distinction between the ideal diet for old age and the ideal diet for any other period of life. The ideal diet will increase the length of life, and the earlier in life it is adopted, and the more consistently it is followed, the greater will be the increase in the count of years. Too often it is only when most of life is past that we begin to value it, and hence are the more concerned with its extension, and the more keen in search of methods of eating that will prolong the years that remain.

If you will read a considerable number of accounts of the habits of living of men who have achieved the distinction of unusual years and a vigorous and hearty old age, you will find

numerous reasons set down in explanation of the unusual longevity. In some instances the chief credit will be given to systems of physical exercise; in some cases, to habits of thought; in others to hours of sleep or an out-door environment; while, on the other hand, you will find the abstinence from some particular vice—or even the addiction to some vice, or the use of some drug (witness the advertisement of Duffy's Pure Malt Whiskey) set down as the cause of longevity. But in all creditable accounts of longevity you will find running through them one element of uniformity: invariably those who live to unusual years have practised abstemious habits of eating. Cornaro, the Italian philosopher, who lived several centuries ago, attained the age of 101; when in his nineties he wrote a book on longevity, in which he ascribed his unusual age and vigor to his spare diet. He has been misquoted as saying that "he lived upon one egg a day"; this, of course, referred only to the use of the single egg in place of meat, but his diet was very simple in quality and very spare in quantity.

In 1635 a certain very old man named Thomas Parr visited King Charles. Mr. Parr informed the king that he (Parr, not the king) lived on cheese, milk, a little coarse bread and

sour whey. Mr. Parr laid claim to 153 years. He may have falsified about his age, though he may have told the truth about his diet.

These stories of those who lived a century or more are always interesting, but they are not so convincing, at least to the scientific mind, as are the statistics of the insurance companies to which reference has been made in our chapter on obesity. The insurance people have no data of the diet of the policy-holders, but they do have records of their weights, and the relation of the weight to the quantity of food eaten is an absolute and positive one. Fat men cannot be light eaters and thin men cannot be heavy eaters, except in abnormal cases. Insurance statistics show that over-weight, and hence over-eating increases the death rate, and this increase is specially marked around the age of forty. Such increase in the death rate diminishes somewhat with further advancing age, but at the age of sixty, the death rate for the fattest group of men was about seventy per cent greater than for the group of the slenderest men of the same age period.

We have no insurance data for men beyond this age group, as too few men are insured after that age to secure reliable statistics. But the facts we have certainly offer very convincing

proof that fat men do not live as long as those of spare frame. Practical observation among the old people you know will convince you of the same fact. Fat old men are very rare, and those who are fat will usually be found to have acquired the condition late in life. Men who have been fat all their lives rarely live beyond the fifties or sixties. It is those with spare frames, and hence abstemious eaters, whom you will find still living in the eighties and nineties.

It did not seem difficult to explain these facts. We simply knew that a light eater who maintained a spare and wiry figure outlived the heavy eater whose form was burdened with fat. Obesity burdens the body and prevents proper activity; over-eating fills the body with surplus food wastes which generate poisons and overtax the excretory organs; moreover, over-eating and obesity cause, or at least, render one more susceptible to various diseases. These facts alone might seem sufficient to explain the greater longevity of the abstemious eater.

However, I believe that we have found an additional explanation in the discoveries that have recently been made concerning the general physiological effects of a light versus the heavy diet. The light eater does not live so fast, hence he lives longer. This statement is literally true,

and the word "fast" is not necessarily used as a synonym for immorality. The restricted diet of Dr. Benedict's experiments resulted in an actual slowing down of the rate of the heart beat; this decrease was in fact about thirty per cent. If we assume that a man comes into this world like a wound-up clock, capable of so many ticks, it seems quite logical that if he ticked fast he would not tick as long—this is an unusual viewpoint, but it may be a great truth that we are only just discovering.

We are accustomed to measuring life in years, that is, the number of times the earth goes round the sun, which has nothing in particular to do with the life processes. Measuring life in the number of heart beats would certainly be more logical. The over-eater who is fat, who pants, is short of breath, who has a high pulse rate and a high blood pressure, is physiologically running too fast, and hence will run down too quickly. The light eater who is spare of frame, who has a slow pulse rate and a low blood pressure, is living more slowly and will hence live longer. Incidentally he has more reserve power for emergencies. Sudden exertion increases the rate of the heart beat, but if it is already beating rapidly due to the burden of digesting and eliminating surplus food, then it has not as

much opportunity left for increase from the legitimate stimulation of exercise. Hence the fat man, when he becomes excited and runs a block, tumbles down with heart disease or breaks a blood vessel and dies from apoplexy.

The doctor's certificate rarely sets down "old age" as the cause of death. The majority of those deaths which occur in late middle life are from diseases plainly related to incorrect living and chiefly to over-eating. It is such deaths that take off a man before his time and shorten life. The way to prevent this is to avoid the cause.

In old age the general activities of the body are decreased. Old people move more slowly and work less vigorously than the young, and, unless special pains have been made to maintain them, the bulk of the muscles materially decrease. All these facts contribute to the reduction of the amount of food needed to maintain life; hence even though the diet has been correctly proportioned in youth, as age advances it should be decreased. If over-eating has been practised in youth and middle life the need of such decrease is much greater.

The nature of the food and the quality of the diet need not be changed. There is less need of energy-producing foods, but there is

also less need of other food elements as all the life processes have been checked in speed and the volume of muscles has usually been decreased. The mineral salts, vitamines and available proteins are still essential; the fat, sugars, and starches which furnish the fuel energy are also required, but in reduced quantities.

In some cases the loss of natural teeth will render mastication a little more difficult, and hence require the adoption of foods more easily masticated. Resort should not be had, however, to excess of starchy porridges, as there are plenty of natural foods that may be eaten without laborious chewing. The adoption of the method previously described in "eating" milk or that used in Horace Fletcher's habit of holding foods, even liquids like milk and soup, in the mouth and working them about until they are mixed with saliva and swallowed instinctively is to be recommended for those who are not able to chew hard foods.

With the wear of years, especially if wrong eating habits have been followed, the digestive powers may become somewhat weakened. The exact nature of the impairment of digestion varies with the individual, and hence cannot be met by any general rules or remedies. There are some foods, however, that are so readily

digested that they may be used by almost any one, no matter how enfeebled the digestion may be. Milk and eggs rank very high in this respect; hence find a large place in the diet of those of weakened digestive powers. Very ripe pulpy fruits may be added to such a list.

I will not, however, prolong these suggestions, for normally there is no occasion for the man or woman of advanced years to be on the invalid list. The pampering and coddling of people merely because they have reached a certain number of years is a fault too often committed by the children or others with whom they may have the ill fortune to live. It is often said that a man is as old as he feels, and the younger generation is prone to make him feel as old as he is, and then some.

On the whole I may say that there are no special dietetic laws for old age that do not apply to adult life in general. It is a question always of eating foods that supply all the elements of nourishment that the body requires and of eating them in sufficient quantity to maintain the body in a wiry, muscular condition. Eat to keep thin as the years advance, and your days upon this earth will be many.

THE END